RABIES CONTROL GUIDELINES

Office of Epidemiology

2000

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INTRODUCTION

The following guidelines are based on, but not identical to, the recommendations of Immunization Practices Advisory Committee (ACIP) of the U.S. Public Health Services and the Compendium of Animal Rabies Control published annually by the National Association of State Public Health Veterinarians (NASPHV). Both documents are included in the appendix of these Guidelines. Please refer to the most recent copies of these documents for further clarification or call the Office of Epidemiology (804-786-6261).

Relevant sections of *Code of Virginia* found in the *Animal Care, Control, Property and Protection Laws of Virginia*:

Unlicensed dogs prohibited: Section 3.1-796.85

Rabies vaccination requirement for licensing dogs: Section 3.1-796-97

Rabies vaccination requirement for dogs and cats: Section 3.1-796.97:1

Confinement or euthanasia of biting or exposed animals: Section 3.1-796.98

Dogs and cats deemed personal property: Section 3.1-796.127

Other relevant sections of the Code:

Withholding information about possibly rabid animal: Section 18.2-213.1

General authority for situations not specifically covered in the Code: *Regulations for Disease Reporting and Control*: 4.00 "Control of Diseases"

DEFINITIONS

Human Exposure

Any bite, scratch or other situation where saliva or central nervous system (CNS) tissue of a potentially rabid animal enters an open, fresh wound or comes in contact with a mucous membrane by entering the eye, mouth, or nose. The touching or handling of a potentially rabid animal or another animal or inanimate object that had contact with a rabid animal does not constitute an exposure unless wet saliva or CNS material from the rabid animal entered a fresh, open wound or had contact with a mucous membrane.

Animal Exposure

Any circumstance where saliva or CNS tissue from a rabid or potentially rabid animal did have or could have had direct contact with mucous membranes or a break in the skin of a domestic animal. The actual witnessing of a bite or attack by a potentially rabid animal is not required in order for an exposure to have occurred. Any potentially rabid animal which has exposed a domestic animal and is not available for laboratory testing should be presumed to be rabid. Domestic animals that bite other domestic animals are not usually considered as rabies suspects unless showing signs compatible with the disease.

Confinement

The animal should be housed in a building, pen or by some other suitable escape-proof method or enclosure. The animal cannot be removed from confinement unless on a leash and under the immediate control of a responsible adult. The animal cannot be moved from the premises unless permission is obtained from the District Health Director. At the first indication of the animal becoming ill, it is the responsibility of the owner or custodian to notify the Health Department and take the animal to a veterinarian for an examination. If rabies is suspected, the animal should be immediately euthanized and the brain tested for rabies. To avoid misunderstanding, such instructions should be provided to the owner or custodian in writing.

Strict Isolation

A kennel in a veterinary hospital, animal control facility, commercial boarding establishment, or a pen at home (see sample plan attached) that prevents direct contact between the animal and any human or other animal, but allows for feeding, watering, and cleaning. The District Health Director or his designee is responsible for approving the adequacy of the isolation unit.

Currently Immunized Against Rabies

An animal is currently immunized against rabies if a vaccination certificate (NASPHV form #50 or 51 is recommended but not required) is available that describes the animal adequately and documents that the animal received rabies vaccine approved by the United States Department of Agriculture (USDA) from a licensed veterinarian; the duration of immunity must be adequate for that animal's species and age as outlined in Part II of the Compendium or described on the USDA approved vaccine label. In lieu of a vaccination certificate the records of the attending veterinarian may suffice.

I. Animals

A. Vaccinations

1. Dogs and Cats

The *Animal Care, Control, Property and Protection Laws of Virginia* require that all dogs and domesticated cats receive rabies vaccine prior to attaining 4 months of age. They also require that all dogs be licensed by 4 months of age and that in order to be licensed, proof of rabies vaccination must be shown. NASPHV form #50 or 51 is recommended, but not required, as documentary proof of rabies immunization.

Dogs and cats should initially be immunized between 3 and 4 months of age. The second vaccination should be administered a year later. If vaccine approved by the USDA for 3 years duration of immunity is used, triennial booster vaccinations can be administered beginning with the second vaccination.

2. Livestock

The number of vaccines for use in livestock is limited (see Compendium). The private veterinary practitioner should decide on the advisability of livestock vaccination, although it seems reasonable to vaccinate livestock only in situations where wildlife rabies exists, valuable livestock are at risk, or there is frequent contact of the livestock with humans, such as in petting zoos and riding stables.

3. Wildlife

Rabies vaccination is not recommended for individual wild animals. There are no injectable rabies vaccines licensed for use in wild animals and there is no evidence that such rabies vaccines produce acceptable levels of immunity in wild animals. Administration of unapproved vaccines may create a false sense of security for people exposed to such animals. Wild animals should not be kept as pets.

RABORAL V-RG is an oral rabies vaccine for use in federal or state raccoon rabies control programs (see appendix).

4. Ferrets

State law does not require ferrets to be vaccinated; however, at least one vaccine is labeled by the USDA (see Compendium) for use in ferrets and its use should be encouraged.

B. Domestic Animal Exposures

1. Human Exposed to Dog, Cat, or Ferret

Any dog, cat, or ferret (vaccinated or unvaccinated) that bites a person must be confined (see definition) for 10 days observation. If symptoms of rabies develop, the animal should be humanely euthanized and tested or, if the animal dies, its head should be immediately submitted for testing. A veterinarian should evaluate the animal at the first sign of illness. All human exposures should be discussed with the District Health Director. Because a reaction to vaccination could be confused with early signs of rabies, rabies vaccinations during confinement are not recommended.

2. Vaccinated Dog, Cat, or Ferret Exposed

Any dog, cat, or ferret which is currently immunized against rabies and which is exposed to a proven or suspected rabid animal should receive an immediate booster dose of rabies vaccine from a licensed veterinarian and be confined (see definitions) for 90 days observation. If symptoms of rabies develop, the animal should be humanely euthanized and tested or if the animal dies, its head should be immediately submitted for testing. A veterinarian should evaluate the animal at the first sign of illness.

NOTE: This time period is greater than the 45 days recommended in the Compendium, but 90 days remains in the *Code of Virginia*. The most important post-exposure action is insuring that a booster vaccination is obtained immediately. The 90-day confinement should be recommended, but resources should not be diverted to enforce it.

3. Unvaccinated Dog, Cat, or Ferret Exposed

Any unvaccinated dog, cat, or ferret that is exposed to a proven or suspected rabid animal should be euthanized unless the exposing animal tests negative for rabies. If the owner of an exposed dog, cat, or ferret is unwilling to euthanize it, the dog, cat, or ferret must be placed in strict isolation (see definition) for a period of 6 months. Vaccination for rabies by a licensed veterinarian one month prior to release from the 6 month period of strict isolation is required by the Code. If symptoms of rabies develop during isolation, the animal should be humanely euthanized and tested or if the animal dies, its head should be immediately submitted for testing. A veterinarian should evaluate the animal at the first signs of illness.

4. Dog, Cat, or Ferret with Expired Vaccination

Any dog, cat, or ferret with an expired vaccination that is exposed and not euthanized should receive an immediate booster and be placed in 6 months strict isolation. Another vaccination should be administered 1 month before release. Depending on the type of exposure, animals with a history of multiple vaccinations and a recently expired vaccination may be handled as currently vaccinated. Any questions should be discussed with personnel in the Office of Epidemiology.

5. Livestock

Livestock such as cattle, horses, sheep, goats, and pigs are not usually at high risk for transmitting rabies. When such animals bite a person many factors should be considered. If the animal's health and behavior are normal, there is no history of exposure, and the area is not endemic for rabies, it may be reasonable to keep the animal under 10 to 14 days observation. Otherwise, euthanasia and testing of the animal or post-exposure prophylaxis of the person should be considered.

Vaccinated livestock that are exposed to a rabid animal should receive an immediate booster, be confined in a manner that is routine for that species, and be observed for signs of rabies for 3 months.

Unvaccinated livestock that are exposed to a rabid animal can be immediately slaughtered. Otherwise they should be kept separate from unexposed animals for 6 months. Exceptions should be discussed with the Office of Epidemiology. A legal quarantine requires coordination with the Virginia Department of Agriculture and Consumer Services and is almost never required. Animal

handlers and attending veterinarians should be reminded to avoid exposure if the animal shows any sign of illness or abnormal behavior.

C. Wildlife

1. Vaccination and Confinement

No injectable rabies vaccines are approved for use in wildlife. Wild animals should not be kept as pets. Permits are required by persons who keep wild animals that are regulated by the Department of Game and Inland Fisheries (DGIF). Assistance is available from DGIF in situations where wild animals are kept without a permit.

Wild carnivorous animals that expose people should be euthanized and tested. Confinement periods are not applicable for wild animals because the length of time during which wild animals are capable of transmitting rabies and the incubation periods for rabies in wild animals are not known.

2. Special Circumstances

Some exposures to wild animals may occur under unusual circumstances, i.e., the animals involved may be valuable zoo or research animals. These situations should be discussed with personnel in the Office of Epidemiology and decisions made on a case-by-case basis. Post-exposure prophylaxis of the victim may be indicated in lieu of sacrificing the animal. Persons who work with such animals should have pre-exposure prophylaxis.

3. High Risk Species

Any fox, skunk, raccoon, groundhog, or bat that bites a person must be considered rabid unless proven otherwise by laboratory testing. Because rabid beavers and opossums have been reported in higher than expected numbers in the raccoon rabies outbreak area, they should also be considered in the high-risk category until proven otherwise.

4. Low Risk Species

Small rodents, rabbits, squirrels, and chipmunks are rarely rabid, have never been known to transmit rabies to a human, and are not considered risks for transmitting rabies unless abnormal/aggressive behavior is noted.

5. Control

a. The Virginia Department of Health recognizes that currently there is no adequate method for directly controlling wildlife rabies. Large scale population reduction programs have not proven effective and vaccination of wildlife has not yet been shown to be cost effective.

b. Wildlife population reduction programs may be useful in the following instances:

(1) In order to remove animals from localized areas of extremely high human-animal contact, such as picnic areas where wildlife show little fear and approach humans expecting handouts;

(2) as part of a scientifically based study to develop or test methods to control wildlife rabies.

c. General or large scale population reduction programs have not been shown to be effective. Some of the problems associated with such population reduction efforts are as follows:

(1) in an area of normal habitat where animal populations are high (urban settings may support higher populations of some species than rural ones), a 60-80% reduction of the population is probably required before intraspecies transmission can be terminated;

(2) reduction efforts must be continuous because new animals will move into the territory from adjacent areas and the reproductive capacity of the remaining animals may increase;

(3) continuous population reduction efforts are prohibitively expensive;

(4) in an endemic or epidemic area, naturally immune animals may be removed thus eliminating a barrier to transmission and encouraging the spread of the disease;

(5) other species, especially pets, may be at risk of being inadvertently affected by the population reduction methods;

(6) live trapping has been demonstrated to be the least cost effective of all population reduction methods;

(7) live trapping requires that the animals be euthanized because relocation of potentially rabid trapped animals increases the risk of rabies spread to uninvolved areas and increases the potential for human exposure.

6. Nuisance Wildlife at High Risk for Rabies

a. Nuisance wildlife can be discouraged by removing attractants such as denning sites and sources of food.

b. If nuisance wildlife are captured, they should not be relocated. This means they should either be released on site or euthanized.

D. Wolf Hybrids and Other Exotic Animals

1. General

For the purposes of rabies control, most exotic carnivorous animals such as hybrid crosses of dogs with wolves or coyotes are considered wild animals. Because incubation periods and duration of virus shedding are unknown for these animals, euthanasia is the safest course of action when such animals bite humans or when they are exposed to a suspected rabid animal. Some species, such as primates, are not very likely to contract rabies and may not require euthanasia. Any questions regarding the disposition of exotic animals should be discussed with personnel in the Office of Epidemiology.

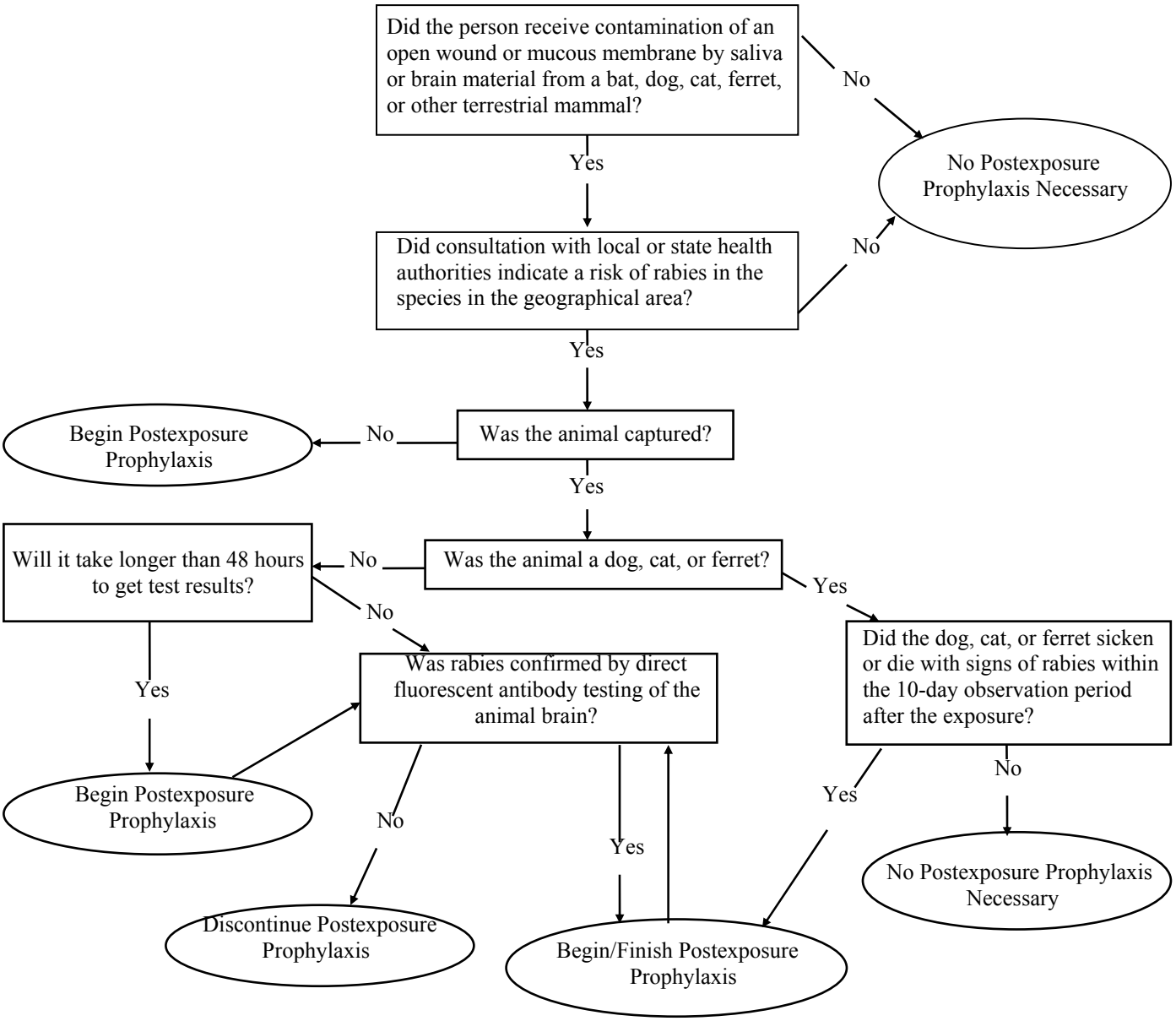
2. Wolf Hybrids

There are no rabies vaccines licensed for use in wolf hybrids and post-exposure management is the same as for other wild animals. Veterinarians may choose to vaccinate hybrids as an extra label use of a biologic, but this does not change the post-exposure management recommendations. Enabling legislation went into effect on July 1, 1997, to allow localities to adopt a permitting system for the regulation of hybrid canines and to set a fee to cover the cost of the permitting system.

II. Human Pre- and Post-Exposure Treatment

Refer to most recent ACIP recommendations and *Morbidity and Mortality Weekly Report* articles on rabies prevention for details on post-exposure management and pre-exposure immunization (The ACIP recommendations are included as a supplement to these Guidelines). See PI 3.16 for policy regarding payment for rabies post-exposure prophylaxis.

RABIES



III. General Control Strategies

A. Vaccination of dogs and cats, elimination of stray domestic animals, assuring responsible pet ownership by enacting and enforcing animal control ordinances.

B. Pre-exposure immunization of humans who are at high risk of inapparent exposure, such as veterinarians and their assistants, raccoon hunters and trappers, animal control personnel, and environmental health specialists who are capturing animals or removing heads.

C. Education of the public to:

1. avoid contact with wildlife (i.e., hand-feeding, touching);

2. discourage wildlife (especially raccoons) from sharing the human environment by removing food sources close to homes, not feeding wildlife, not feeding pets outside, securing trash cans, and excluding wildlife from denning sites in and around buildings;

3. promptly report exposures to potentially rabid animals in order to receive appropriate treatment.

IV. Laboratory Testing for Rabies

A. Submission Policy

1. When a rabies suspect exposes a person, it is an emergency and transfer of the animal head to the laboratory for testing should be of the highest priority.

2. Due to limited resources, it is best to be discriminating when deciding which other animals to submit for rabies testing. Potentially rabid animals that cannot be confined and observed for 10 days are tested for rabies to help decide whether it is necessary to administer post-exposure treatment to a person or to confine or euthanize a domestic animal that may have been exposed to the suspect animal. Animals that have not exposed a person or domestic animal should not be submitted for testing unless a finding of rabies in that animal would necessitate some action by health officials or would add greatly to the knowledge about rabies. For example, a raccoon that is behaving suspiciously but has not exposed a person or domestic animal should probably not be submitted for testing if it is in a county or area where raccoon rabies is known to exist. However, testing a highly suspicious animal from an area where rabies has not been previously documented could reveal important information.

3. See PI 5.13 for responsibility of local health department.

B. Laboratory Protocol

Refer to the attached "Rabies Laboratory Protocol" from the Department of General Services, Division of Consolidated Laboratory Services and the memo of understanding with the Department of Agriculture and Consumer Services or confer with the laboratory that does the rabies testing for your locality.

C. Head Removal

Refer to the attached "Suggestions for Removing Animal Heads for Rabies Testing". A videotape illustrating safe head removal is either available from your Health District office or the Office of Epidemiology.

SUGGESTIONS FOR REMOVING ANIMAL HEADS FOR RABIES TESTING

NOTE: Bats and small rodents should be submitted intact.

I. PURPOSE

A. Submit a good specimen that will allow for accurate testing.

B. Prevent human infection.

II. SUPPLIES

A. Sharp knife and sharpener.

B. Optional - sharp hacksaw, dehorner, lopping shears, pruning shears, or brush cutters.

C. Protective clothing:

1. Waterproof gloves (preferably disposable).
2. Mask (disposable or launderable).
3. Safety glasses or goggles.
4. Optional - coveralls, waterproof apron.

D. Cleaning Supplies

1. Detergent.
2. Disinfectant.
3. Paper towels.
4. Plastic trash bags.

III. PROCEDURE

A. Head Removal

NOTE: These methods are suggestions. Use the technique with which you are most familiar and feel most comfortable.

1. a. Lay animal on its back and extend the head by pushing top of nose toward ground or bend neck back over edge of table.

b. Locate larynx (voice box). Immediately behind the larynx, using a sharp knife, make an incision through the skin and continue cutting down through the trachea and esophagus to the backbone.

c. If you have cut in the correct place, you can identify the membrane covering the spinal cord between the first vertebrae (atlas) and the skull (occipital bone). The joint made by these two bones can be visualized and palpated as the animal's head is flexed and extended.

d. The next step is to disarticulate the atlanto-occipital joint. It is possible to dissect the ligaments connecting this joint, but probably easier and faster to hyperextend the head and manually tear the ligaments. You will hear and feel a snap when this is accomplished.

e. After disarticulation of the atlanto-occipital joint, the remaining muscle and skin can be cut with a knife to completely free the head from the body.

2. Some individuals may prefer to cut through the vertebra instead of disarticulating the joint. After cutting down to the backbone use shears or a hacksaw, to cut through the first vertebra. DO NOT use an axe, hatched or power saw because of the danger created by flying debris.

B. Packaging

Each animal should be individually identified and packaged.

Pack the head in a water-tight container (e.g. ziplock plastic bag) and place in larger water-tight container (preferably metal or styrofoam) with frozen gel-type cold packs.

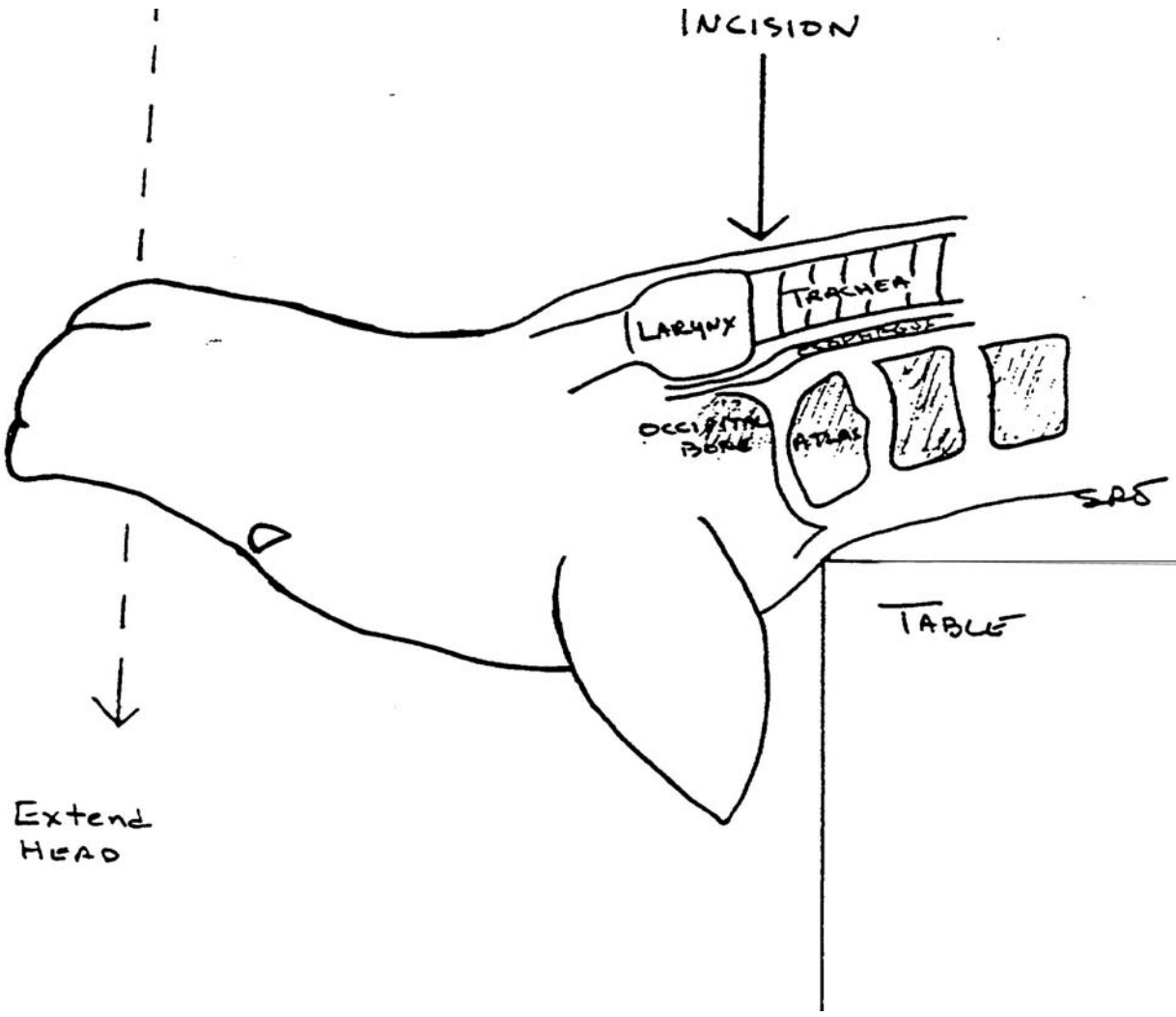
(For more details, see Rabies Protocol, Revised September 1989, from the Department of General Services, Division of Consolidated Laboratory Services, Bureau of Microbiological Science.)

C. Clean up

1. Instruments and contaminated surfaces should be washed with detergent and water, and disinfected with a solution of clorox (100 ppm), alcohol (40-70% ethanol), and iodine (25 ppm) or quaternery ammonium (200 ppm) compounds.

2. The body of the animal should be incinerated. If this is not possible, it can be buried at a depth of at least 3 feet.

Virginia Department of Health
Office of Epidemiology
June 12, 1986


INCISION
LARYNX
TRACHEA
ATLAS
SPS
TABLE
Extend
HEAD

ISOLATION PEN FOR UNVACCINATED DOGS AND CATS EXPOSED TO RABIES
Minimum Construction Detail adapted 8/89 from original by Douglas Hubbard

Scale 1:20

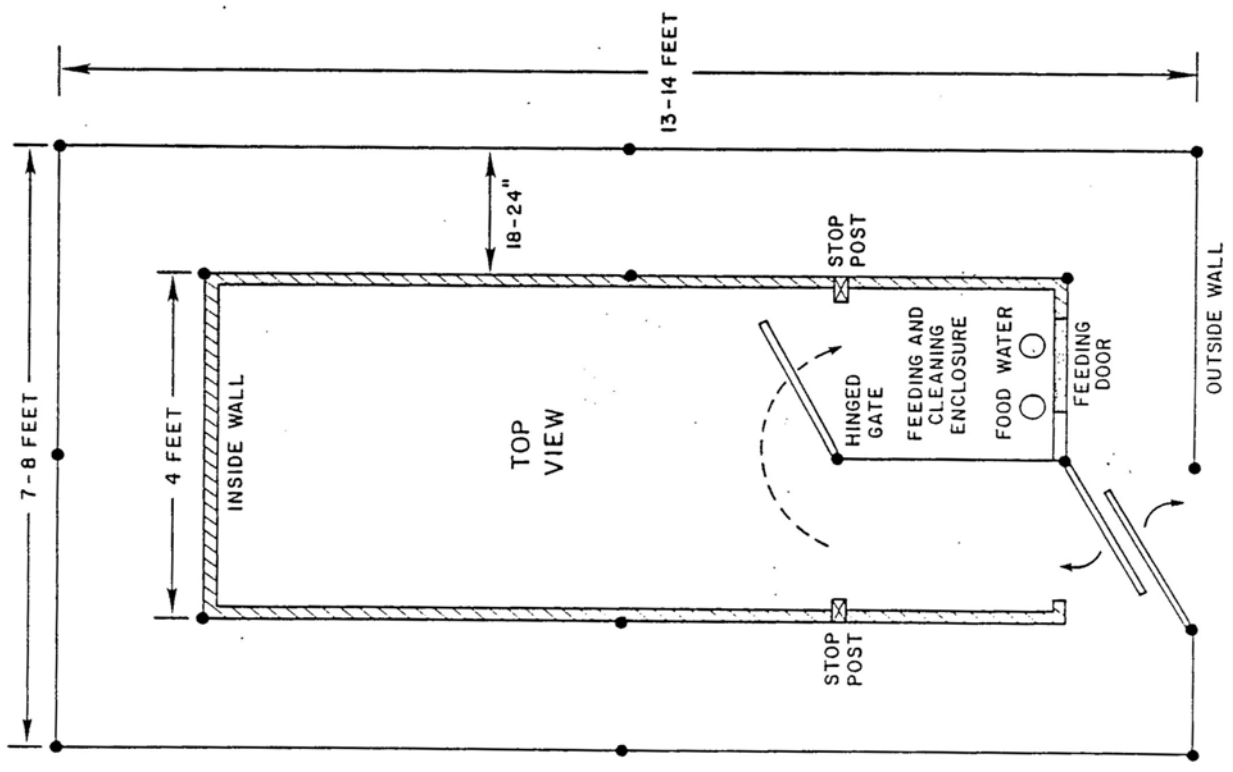
Construction provides:

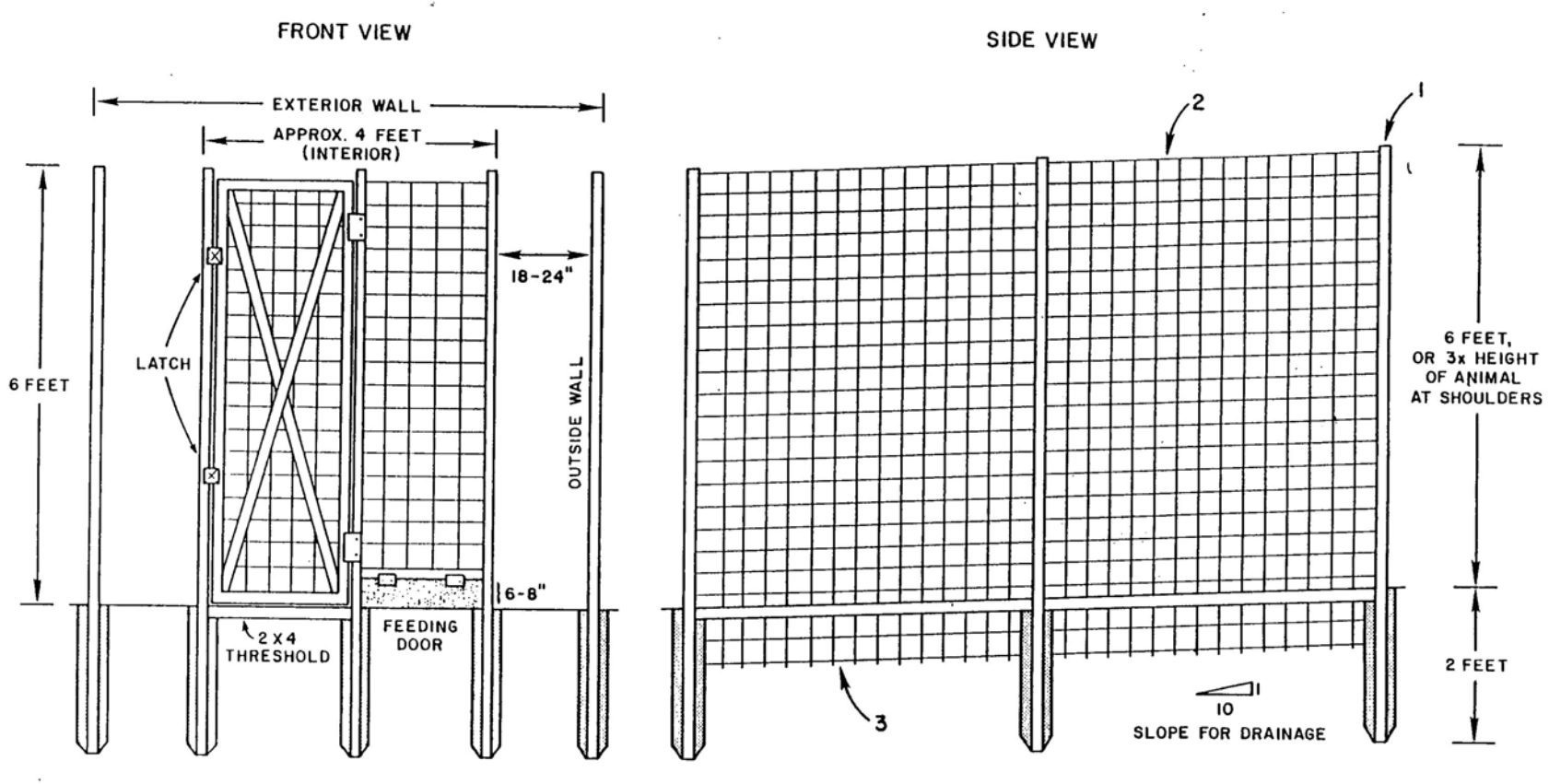
A. Double enclosure to prevent escape and direct contact with people or other animals.

B. Feeding enclosure and door to allow for feeding without direct contact of animal and handler and to provide confinement of animal during cleaning.

C. L-shaped metal plates or extension of wire fencing buried to prevent digging out.

Overall length and width are approximate and may vary depending on requirements of animal. Height should be 3x the height of the animal at the shoulders.





Scale1:20

1 = 4” X 4” posts, pressure treated or equivalent, driven or set in concrete.

2 = Wire, chain link, 2” X 2” hardware cloth (welded) or

3 = L-shaped metal plates or wire bent at 90° angle for 12-18” and buried 4-6” below surface of ground to prevent digging out.

Compendium of Animal Rabies Prevention and Control, 2003*
National Association of State Public Health Veterinarians, Inc. (NASPHV)

Rabies is a fatal viral zoonosis and a serious public health problem[1]. The purpose of this Compendium is to provide information to veterinarians, public health officials, and others concerned with rabies prevention and control. These recommendations serve as the basis for animal rabies-control programs throughout the United States and facilitate standardization of procedures among jurisdictions, thereby contributing to an effective national rabies-control program. This document is reviewed annually and revised as necessary. Parenteral vaccination procedure recommendations are contained in Part I; Part II details the principles of rabies control; all animal rabies vaccines licensed by the United States Department of Agriculture (USDA) and marketed in the United States are listed in Part III.

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Council of State and Territorial Epidemiologists (CSTE)

Part I: Recommendations for Parenteral Vaccination Procedures

A. VACCINE ADMINISTRATION: All animal rabies vaccines should be restricted to use by, or under the direct supervision of, a veterinarian[2]. All vaccines must be administered in accordance with the specifications of the product label or package insert.

B. VACCINE SELECTION: Part III lists all vaccines licensed by USDA and marketed in the United States at the time of publication. New vaccine approvals or changes in label specifications made subsequent to publication should be considered as part of this list. Any of the listed vaccines can be used for revaccination, even if the product is not the same brand as previously administered vaccines. Vaccines used in state and local rabies control programs should have a 3-year duration of immunity. This constitutes the most effective method of increasing the proportion of immunized dogs and cats in any population[3]. There are no laboratory or epidemiologic data to support the annual or biennial administration of 3-year vaccines following the initial series.

C. ADVERSE EVENTS: Currently, there is no epidemiologic association between a particular licensed vaccine product and adverse events including vaccine failure. Adverse reactions or rabies in a currently vaccinated animal should be reported to USDA, Animal and Plant Health Inspection Service, Center for Veterinary Biologics at (800) 752-6255 or by e-mail to CVB@usda.gov.

D. WILDLIFE AND HYBRID ANIMAL VACCINATION: The efficacy of parenteral rabies vaccination of wildlife and hybrids (the offspring of wild animals crossbred to domestic animals) has not been established, and no such vaccine is licensed for these animals. Zoos or research institutions may establish vaccination programs, which attempt to protect valuable animals, but these should not replace appropriate public health activities that protect humans.

E. ACCIDENTAL HUMAN EXPOSURE TO VACCINE: Human exposure to parenteral animal rabies vaccines listed in Part III does not constitute a risk for rabies infection. However, human exposure to vaccinia-vectored oral rabies vaccines should be reported to state health officials[4].

F. IDENTIFICATION OF VACCINATED ANIMALS: Agencies and veterinarians may adopt a standard tag system to aid in the administration of animal rabies control procedures.

1.	**RABIES TAGS :**	CALENDAR YEAR	COLOR	SHAPE
		2003	Green	Bell

2. RABIES CERTIFICATE: All agencies and veterinarians should use the NASPHV Form #51, "Rabies Vaccination Certificate," which can be obtained from vaccine manufacturers. This form can also be found on the CDC website (www.cdc.gov/ncidod/dvrd/rabies/professional/professi.htm). Computer-generated forms containing the same information are acceptable.

Part II: Rabies Control

A. PRINCIPLES OF RABIES CONTROL

1. **RABIES EXPOSURE:** Rabies is transmitted only when the virus is introduced into bite wounds, open cuts in skin, or onto mucous membranes[5].

2. **HUMAN RABIES PREVENTION:** Rabies in humans can be prevented either by eliminating exposures to rabid animals or by providing exposed persons with prompt local treatment of wounds combined with human rabies immune globulin and vaccine. The rationale for recommending preexposure and postexposure rabies prophylaxis and details of their administration can be found in the current recommendations of the Advisory Committee on Immunization Practices (ACIP)[5]. These recommendations, along with information concerning the current local and regional status of animal rabies and the availability of human rabies biologics, are available from state health departments.

3. **DOMESTIC ANIMALS:** Local governments should initiate and maintain effective programs to ensure vaccination of all dogs, cats, and ferrets and to remove strays and unwanted animals. Such procedures in the United States have reduced laboratory-confirmed cases of rabies in dogs from 6,949 in 1947 to 89 in 2001[6]. Because more rabies cases are reported annually involving cats (270 in 2001) than dogs, vaccination of cats should be required. Animal shelters and animal control authorities should establish policies to ensure that adopted animals are vaccinated against rabies. The recommended vaccination procedures and the licensed animal vaccines are specified in Parts I and III of the Compendium.

4. **RABIES IN WILDLIFE:** The control of rabies among wildlife reservoirs is difficult[7]. Vaccination of free-ranging wildlife or selective population reduction might be useful in some situations, but the success of such procedures depends on the circumstances surrounding each rabies outbreak. (See Part C. Control Methods in Wildlife) Because of the risk of rabies in wild animals (especially raccoons, skunks, coyotes, foxes, and bats), the AVMA, the NASPHV, and the CSTE strongly recommend the enactment of state laws prohibiting their importation, distribution, and relocation.

5. **RABIES SEROLOGY:** Evidence of circulating rabies virus neutralizing antibodies should not be used as a substitute for current vaccination in managing rabies exposures or determining the need for booster vaccinations[8].

B. CONTROL METHODS IN DOMESTIC AND CONFINED ANIMALS

1. **PREEXPOSURE VACCINATION AND MANAGEMENT:** Parenteral animal rabies vaccines should be administered only by, or under the direct supervision of, a veterinarian. This ensures that a qualified and responsible person can be held accountable to assure the public that the animal has been properly vaccinated. Within twenty-eight (28) days after primary vaccination, a peak rabies antibody titer is reached and the animal can be considered immunized. An animal is currently vaccinated and is considered immunized if the primary vaccination was administered at least 28 days previously and vaccinations have been administered in accordance with this Compendium.

   Regardless of the age of the animal at initial vaccination, a booster vaccination should be administered 1 year later (See Parts I and III for vaccines and procedures). There are no laboratory or epidemiologic data to support the annual or biennial administration of 3-year vaccines following the initial series. Because a rapid anamnestic response is expected, an animal is considered currently vaccinated immediately after a booster vaccination.

   (a) DOGS, CATS, AND FERRETS
   All dogs, cats, and ferrets should be vaccinated against rabies and revaccinated in accordance with Part III of this Compendium. If a previously vaccinated animal is overdue for a booster, it should be revaccinated with a single dose of vaccine. Immediately following the booster, the animal is considered currently vaccinated and should be placed on an annual or triennial schedule depending on the type of vaccine used.

   (b) LIVESTOCK
   Consideration should be given to vaccinating livestock that are particularly valuable or that might have frequent contact with humans (e.g., in petting zoos, fairs, and other public exhibitions). Horses traveling interstate should be currently vaccinated against rabies.

   (c) CONFINED ANIMALS

   (1) WILD
   No parenteral rabies vaccine is licensed for use in wild animals. Wild animals or hybrids should not be kept as pets[9-12].

   (2) MAINTAINED IN EXHIBITS AND IN ZOOLOGICAL PARKS
   Captive mammals that are not completely excluded from all contact with rabies vectors can become infected. Moreover, wild animals might be incubating rabies when initially captured; therefore, wild-caught animals susceptible to rabies should be quarantined for a minimum of 6 months before being exhibited. Employees who work with animals at such facilities should receive preexposure rabies vaccination. The use of pre- or postexposure rabies vaccinations for employees who work with animals at such facilities might reduce the need for euthanasia of captive animals. Carnivores and bats should be housed in a manner that precludes direct contact with the public.

2. **STRAY ANIMALS:** Stray dogs, cats, and ferrets should be removed from the community. Local health departments and animal control officials can enforce the removal of strays more effectively if owned animals are confined or kept on leash. Strays should be impounded for at least 3 days to determine if human exposure has occurred and to give owners sufficient time to reclaim animals.

3. **IMPORTATION AND INTERSTATE MOVEMENT OF ANIMALS**

(a) INTERNATIONAL. CDC regulates the importation of dogs and cats into the United States. Imported dogs must satisfy rabies vaccination requirements (42 CFR, Part 71.51[c], www.cdc.gov/ncidod/dq/lawsand/htm). The appropriate health official of the state of destination should be notified within 72 hours of the arrival into his or her jurisdiction of any imported dog required to be placed in confinement under the CDC regulation. Failure to comply with these requirements should be promptly reported to the Division of Global Migration and Quarantine, CDC, (404) 498-1670.

CDC regulations alone are insufficient to prevent the introduction of rabid animals into the country. All imported dogs and cats are subject to state and local laws governing rabies and should be currently vaccinated against rabies in accordance with the Compendium. Failure to comply with state or local requirements should be referred to the appropriate state or local official.

(b) INTERSTATE. Before interstate movement, dogs, cats, and ferrets should be currently vaccinated against rabies in accordance with the Compendium's recommendations (See Part II, B.1. Preexposure Vaccination and Management). Animals in transit should be accompanied by a currently valid NASPHV Form #51, Rabies Vaccination Certificate. When an interstate health certificate or certificate of veterinary inspection is required, it should contain the same rabies vaccination information as Form #51.

4. **ADJUNCT PROCEDURES:** Methods or procedures which enhance rabies control include the following:

(a) IDENTIFICATION. Dogs, cats and ferrets should be identified (e.g., metal or plastic tags, microchips, etc.) to allow for verification of rabies vaccination status.

(b) LICENSURE. Registration or licensure of all dogs, cats, and ferrets may be used to aid in rabies control. A fee is frequently charged for such licensure and revenues collected are used to maintain rabies- or animal-control programs. Vaccination is an essential prerequisite to licensure.

(c) CANVASSING OF AREA. House-to-house canvassing by animal control officials facilitates enforcement of vaccination and licensure requirements.

(d) CITATIONS. Citations are legal summonses issued to owners for violations, including the failure to vaccinate or license their animals. The authority for officers to issue citations should be an integral part of each animal-control program.

(e) ANIMAL CONTROL. All communities should incorporate stray animal control, leash laws, and training of personnel in their programs.

5. **POSTEXPOSURE MANAGEMENT:** Any animal potentially exposed to rabies virus (See Part II, A. 1. Rabies Exposure) by a wild, carnivorous mammal or a bat that is not available for testing should be regarded as having been exposed to rabies.

(a) DOGS, CATS, AND FERRETS. Unvaccinated dogs, cats, and ferrets exposed to a rabid animal should be euthanized immediately. If the owner is unwilling to have this done, the animal should be placed in strict isolation for 6 months and vaccinated 1 month before being released. Animals with expired vaccinations need to be evaluated on a case-by-case basis. Protocols for the postexposure vaccination of previously unvaccinated domestic animals have not been validated, and there is evidence that the use of vaccine alone will not prevent the disease[13]. Dogs, cats, and ferrets that are currently vaccinated should be revaccinated immediately, kept under the owner's control, and observed for 45 days.

(b) LIVESTOCK. All species of livestock are susceptible to rabies; cattle and horses are among the most frequently infected. Livestock exposed to a rabid animal and currently vaccinated with a vaccine approved by USDA for that species should be revaccinated immediately and observed for 45 days. Unvaccinated livestock should be slaughtered immediately. If the owner is unwilling to have this done, the animal should be kept under close observation for 6 months.

The following are recommendations for owners of unvaccinated livestock exposed to rabid animals:

(1) If the animal is slaughtered within 7 days of being bitten, its tissues may be eaten without risk of infection, provided that liberal portions of the exposed area are discarded. Federal guidelines for meat inspectors require that any animal known to have been exposed to rabies within 8 months be rejected for slaughter.

(2) Neither tissues nor milk from a rabid animal should be used for human or animal consumption[14]. Pasteurization temperatures will inactivate rabies virus, therefore, drinking pasteurized milk or eating cooked meat does not constitute a rabies exposure.

(3) Having more than one rabid animal in a herd or having herbivore-to-herbivore transmission is uncommon; therefore, restricting the rest of the herd if a single animal has been exposed to or infected by rabies might not be necessary.

(c) OTHER ANIMALS. Other mammals bitten by a rabid animal should be euthanized immediately. Animals maintained in USDA licensed research facilities or accredited zoological parks should be evaluated on a case-by-case basis.

6. MANAGEMENT OF ANIMALS THAT BITE HUMANS

(a) A healthy dog, cat, or ferret that bites a person should be confined and observed daily for 10 days; administration of rabies vaccine is not recommended during the observation period. Such animals should be evaluated by a veterinarian at the first sign of illness during confinement. Any illness in the animal should be reported immediately to the local health department. If signs suggestive of rabies develop, the animal should be euthanized and the head shipped for testing as described in (c) below. Any stray or unwanted dog, cat, or ferret that bites a person may be euthanized immediately and the head submitted for rabies examination.

(b) Other biting animals, which might have exposed a person to rabies, should be reported immediately to the local health department. Prior vaccination of an animal may not preclude the necessity for euthanasia and testing if the period of virus shedding is unknown for that species. Management of animals other than dogs, cats, and ferrets depends on the species, the circumstances of the bite, the epidemiology of rabies in the area, the biting animal's history, current health status, and potential for exposure to rabies.

(c) Rabies testing should be done by a qualified laboratory, designated by the local or state health department[15]. Euthanasia[16] should be accomplished in such a way as to maintain the integrity of the brain so that the laboratory can recognize the anatomical parts. Except in the case of very small animals, such as bats, only the head or brain (including brain stem) should be submitted to the laboratory. Any animal or animal part being submitted for testing should be kept under refrigeration (not frozen or chemically fixed) during storage and shipping.

C. CONTROL METHODS RELATED TO WILDLIFE: The public should be warned not to handle or feed wild mammals. Wild mammals and hybrids that bite or otherwise expose persons, pets, or livestock should be considered for euthanasia and rabies examination. A person bitten by any wild mammal should immediately report the incident to a physician who can evaluate the need for antirabies treatment (See current rabies prophylaxis recommendations of the ACIP[5]). State regulated wildlife rehabilitators may play a role in a comprehensive rabies control program. Minimum standards for persons who rehabilitate wild mammals should include rabies vaccination, appropriate training and continuing education. Translocation of infected wildlife has contributed to the spread of rabies[17]; therefore, the translocation of known terrestrial rabies reservoir species should be prohibited.

1. TERRESTRIAL MAMMALS: The use of licensed oral vaccines for the mass vaccination of free-ranging wildlife should be considered in selected situations, with the approval of the state agency responsible for animal rabies control[7]. The distribution of oral rabies vaccine should be based on scientific assessments of the target species and followed by timely and appropriate analysis of surveillance data; such results should be provided to all stakeholders. Continuous and persistent programs for trapping or poisoning wildlife are not effective in reducing wildlife rabies reservoirs on a statewide basis. However, limited control in high-contact areas (e.g., picnic grounds, camps, suburban areas) may be indicated for the removal of selected high-risk species of wildlife[7]. State agriculture, public health and wildlife agencies should be consulted for planning, coordination, and evaluation of vaccination or population-reduction programs.

2. BATS: Indigenous rabid bats have been reported from every state except Hawaii, and have caused rabies in at least 36 humans in the United States[18]. Bats should be excluded from houses and adjacent structures to prevent direct association with humans[19, 20]. Such structures should then be made bat-proof by sealing entrances used by bats. Controlling rabies in bats through programs designed to reduce bat populations is neither feasible nor desirable.

Part III: Rabies Vaccines Licensed and Marketed in the U.S., 2003

Product Name	Produced by	Marketed by	For Use In	Dosage	Age at Primary Vaccination[a]	Booster Recommended	Route of Inoculation
A) MONOVALENT (Inactivated)							
DEFENSOR 1	Pfizer, Incorporated License No. 189	Pfizer, Incorporated	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	IM or SC[d] SC
DEFENSOR 3	Pfizer, Incorporated License No. 189	Pfizer, Incorporated	Dogs Cats Sheep Cattle	1 ml 1 ml 2 ml 2 ml	3 months 3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually Annually	IM or SC SC IM IM
RABDOMUN 1	Pfizer, Incorporated License No. 189	Schering-Plough	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	IM or SC SC
RABDOMUN	Pfizer, Incorporated License No. 189	Schering-Plough	Dogs Cats Sheep Cattle	1 ml 1 ml 2 ml 2 ml	3 months 3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually Annually	IM or SC SC IM IM

Product Name	Produced by	Marketed by	For Use In	Dosage	Age at Primary Vaccination[a]	Booster Recommended	Route of Inoculation
A) MONOVALENT (Inactivated) continued							
TRIMUNE	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Dogs Cats	1 ml 1 ml	3 months[b] 3 months	1 year later & triennially 1 year later & triennially	IM[c] IM
RABVAC 1	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	IM or SC IM or SC
RABVAC 3	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Dogs Cats Horses	1 ml 1 ml 2 ml	3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually	IM or SC IM or SC IM
PRORAB-1	Intervet, Incorporated License No. 286	Intervet, Incorporated	Dogs Cats Sheep	1 ml 1 ml 2 ml	3 months 3 months 3 months	Annually Annually Annually	IM or SC IM or SC IM
PRORAB-3F	Intervet, Incorporated License No. 286	Intervet, Incorporated	Cats	1 ml	3 months	1 year later & triennially	IM or SC
IMRAB 3	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats Sheep Cattle Horses Ferrets	1 ml 1 ml 2 ml 2 ml 2 ml 1 ml	3 months 3 months 3 months 3 months 3 months 3 months	1 year later & triennially 1 year later & triennially 1 year later & triennially Annually Annually Annually	IM or SC IM or SC IM or SC IM or SC IM or SC SC
IMRAB 3 TF	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats Ferrets	1 ml 1 ml 1 ml	3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually	IM or SC IM or SC SC
IMRAB Large Animal	Merial, Incorporated License No. 298	Merial, Incorporated	Cattle Horses Sheep	2 ml 2 ml 2 ml	3 months 3 months 3 months	Annually Annually 1 year later & triennially	IM or SC IM or SC IM or SC
IMRAB 1	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	SC SC
B) MONOVALENT (Rabies glycoprotein, live canary pox vector)							
PUREVAX Feline Rabies	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
C) COMBINATION (Inactivated rabies)							
ECLIPSE 3 + FeLV/R	Fort Dodge Animal Health License No. 112	Schering-Plough	Cats	1 ml	3 months	Annually	IM or SC
ECLIPSE 4 + FeLV/R	Fort Dodge Animal Health License No. 112	Schering-Plough	Cats	1 ml	3 months	Annually	IM or SC
Fel-O-Guard 3 + FeLV/R	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Cats	1 ml	3 months	Annually	IM or SC
Fel-O-Guard 4 + FeLV/R	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Cats	1 ml	3 months	Annually	IM or SC
IMRAB 3 + Feline 3	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1 ml	3 months	1 year later & triennially	SC
IMRAB 3 + Feline 4	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1 ml	3 months	1 year later & triennially	SC
MYSTIQUE II	Intervet, Incorporated License No. 286	Intervet, Incorporated	Horses	1 ml	3 months	Annually	IM
Equine POTOMAVAC + IMRAB	Merial, Incorporated License No. 298	Merial, Incorporated	Horses	1 ml	3 months	Annually	IM
D) COMBINATION (Rabies glycoprotein, live canary pox vector)							
PUREVAX Feline 3/ Rabies	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
PUREVAX Feline 4/ Rabies	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
PUREVAX Feline 3/ Rabies + LEUCAT	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
PUREVAX Feline 4/ Rabies + LEUCAT	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
E) ORAL (Rabies glycoprotein, live vaccinia vector) - RESTRICTED TO USE IN STATE AND FEDERAL RABIES CONTROL PROGRAMS							
RABORAL V-RG	Merial, Incorporated License No. 298	Merial, Incorporated	Raccoons Coyotes	N/A	N/A	As determined by local authorities	Oral

a. Minimum age (or older) and revaccinated one year later.
b. A month = 28 days
c. Intramuscularly
d. Subcutaneously

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Recommendations of the Advisory Committee on Immunization Practices (ACIP)

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention (CDC)
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Human Rabies Prevention – United States, 1999
Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Summary

*These revised recommendations of the Advisory Committee on Immunization Practices update the previous recommendations on rabies prevention (MMWR 1991;40[No.RR-3]:1–14) to reflect the current status of rabies and antirabies biologics in the United States. This report includes new information about a human rabies vaccine approved for U.S. use in 1997, recommendations regarding exposure to bats, recommendations regarding an observation period for domestic ferrets, and changes in the local administration of rabies immune globulin.**

INTRODUCTION

Rabies is a viral infection transmitted in the saliva of infected mammals. The virus enters the central nervous system of the host, causing an encephalomyelitis that is almost always fatal. After the marked decrease of rabies cases among domestic animals in the United States in the 1940s and 1950s, indigenously acquired rabies among humans decreased substantially (*1*). In 1950, for example, 4,979 cases of rabies were reported among dogs, and 18 cases were reported among humans. Between 1980 and 1997, 95–247 cases were reported each year among dogs, and on average only two human cases were reported each year in which rabies was attributable to variants of the virus associated with indigenous dogs (*2*). Thus, the likelihood of human exposure to a rabid domestic animal in the United States has decreased greatly. However, during the same period, 12 cases of human rabies were attributed to variants of the rabies virus associated with dogs from outside the United States (*3,4*). Therefore, international travelers to areas where canine rabies is still endemic have an increased risk of exposure to rabies.

Rabies among wildlife — especially raccoons, skunks, and bats — has become more prevalent since the 1950s, accounting for >85% of all reported cases of animal rabies every year since 1976 (*1*). Rabies among wildlife occurs throughout the continental United States; only Hawaii remains consistently rabies-free. Wildlife is the most important potential source of infection for both humans and domestic animals in the United States. Since 1980, a total of 21 (58%) of the 36 human cases of rabies diagnosed in the United States have been associated with bat variants (*2,5,6*). In most other countries — including most of Asia, Africa, and Latin America — dogs remain the major species with rabies and the most common source of rabies among humans. Twelve (33%) of the 36 human rabies deaths reported to the Centers for Disease Control and Prevention (CDC) from 1980 through 1997 appear to have been related to rabid animals outside the United States (*2,6*).

*For assistance with problems or questions about rabies prophylaxis, contact your local or state health department. If local or state health department personnel are unavailable, call the Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases, CDC at (404) 639-1050 during working hours or (404) 639-2888 during nights, weekends, and holidays.

Although rabies among humans is rare in the United States, every year approximately 16,000–39,000 persons receive postexposure prophylaxis (*7*). To appropriately manage potential human exposures to rabies, the risk of infection must be accurately assessed. Administration of rabies postexposure prophylaxis is a medical urgency, not a medical emergency, but decisions must not be delayed. Systemic prophylactic treatments occasionally are complicated by adverse reactions, but these reactions are rarely severe (*8*–*12*).

Data on the safety, immunogenicity, and efficacy of active and passive rabies immunization have come from both human and animal studies. Although controlled human trials have not been performed, extensive field experience from many areas of the world indicates that postexposure prophylaxis combining wound treatment, passive immunization, and vaccination is uniformly effective when appropriately applied (*13*–*18*). However, rabies has occasionally developed among humans when key elements of the rabies postexposure prophylaxis regimens were omitted or incorrectly administered (see Treatment Outside the United States).

RABIES BIOLOGICS

Two types of rabies immunizing products are available in the United States (Table 1):

- Rabies vaccines induce an active immune response that includes the production of neutralizing antibodies. This antibody response requires approximately 7–10 days to develop and usually persists for $2 years.

- Rabies immune globulin (RIG) provides a rapid, passive immunity that persists for only a short time (half-life of approximately 21 days) (*19*).

In all postexposure prophylaxis regimens, except for persons previously immunized, both products should be used concurrently.

TABLE 1. Rabies biologics — United States, 1999

Human rabies vaccine	Product name	Manufacturer
Human diploid cell vaccine (HDCV) • Intramuscular • Intradermal	Imovax® Rabies Imovax® Rabies I.D.	Pasteur-Merieux Serum et Vaccins, Connaught Laboratories, Inc. Phone: (800) VACCINE (*822-2463*)
Rabies vaccine adsorbed (RVA) • Intramuscular	Rabies Vaccine Adsorbed (RVA)	BioPort Corporation Phone: (517) 335-8120
Purified chick embryo cell vaccine (PCEC) • Intramuscular	RabAvert™	Chiron Corporation Phone: (800) CHIRON8 (*244-7668*)
Rabies immune globulin (RIG)	Imogam® Rabies-HT	Pasteur-Merieux Serum et Vaccins, Connaught Laboratories, Inc. Phone: (800) VACCINE (822-2463)
	BayRab™	Bayer Corporation Pharmaceutical Div. Phone: (800) 288-8370

Vaccines Licensed for Use in the United States

Four formulations of three inactivated rabies vaccines are currently licensed for preexposure and postexposure prophylaxis in the United States (Table 1). When used as indicated, all three types of rabies vaccines are considered equally safe and efficacious. The potency of one dose is $2.5 international units (IU) per 1.0 mL of rabies virus antigen, which is the World Health Organization recommended standard (*20*). A full 1.0-mL dose can be used for both preexposure and postexposure prophylaxis. However, only the Imovax® Rabies I.D. vaccine (human diploid cell vaccine [HDCV]) has been evaluated and approved by the Food and Drug Administration (FDA) for the intradermal dose and route for preexposure vaccination (*21–24*). Therefore, rabies vaccine adsorbed (RVA) and purified chick embryo cell vaccine (PCEC) should not be used intradermally. Usually, an immunization series is initiated and completed with one vaccine product. No clinical studies have been conducted that document a change in efficacy or the frequency of adverse reactions when the series is completed with a second vaccine product.

Human Diploid Cell Vaccine (HDCV)

HDCV is prepared from the Pitman-Moore strain of rabies virus grown on MRC-5 human diploid cell culture, concentrated by ultrafiltration, and inactivated with betapropiolactone (*16*). It is supplied in two forms:

- Intramuscular (IM) administration, a single-dose vial containing lyophilized vaccine that is reconstituted in the vial with the accompanying diluent to a final volume of 1.0 mL just before administration.

- Intradermal (ID) administration, a single-dose syringe containing lyophilized vaccine that is reconstituted in the syringe to a final volume of 0.1 mL just before administration (*25*).

Rabies Vaccine Adsorbed (RVA)

RVA was developed and is currently manufactured and distributed in the state of Michigan by BioPort Corporation. The vaccine is prepared from the Kissling strain of Challenge Virus Standard (CVS) rabies virus adapted to fetal rhesus lung diploid cell culture (*26–31*). The vaccine virus is inactivated with betapropiolactone and concentrated by adsorption to aluminum phosphate. Because RVA is adsorbed to aluminum phosphate, it is liquid rather than lyophilized. It is approved for IM administration only as a 1.0-mL dose.

Purified Chick Embryo Cell Vaccine (PCEC)

PCEC became available in the United States in autumn 1997 (*32*). It is prepared from the fixed rabies virus strain Flury LEP grown in primary cultures of chicken fibroblasts. The virus is inactivated with betapropiolactone and further processed by zonal centrifugation in a sucrose density gradient. It is formulated for IM administration only. PCEC is available in a single-dose vial containing lyophilized vaccine that is reconstituted in the vial with the accompanying diluent to a final volume of 1.0 mL just before administration.

Rabies Immune Globulin Licensed for Use in the United States

The two RIG products, BayRab™ and Imogam® Rabies-HT (Table 1), are an antirabies immunoglobulin (IgG) preparation concentrated by cold ethanol fractionation from plasma of hyperimmunized human donors. Rabies neutralizing antibody, standardized at a concentration of 150 IU per mL, is supplied in 2-mL (300 IU) vials for pediatric use and 10-mL (1,500 IU) vials for adult use; the recommended dose is 20 IU/kg body weight. Both RIG preparations are considered equally efficacious when used as described in this report (see Treatment of Wounds and Immunization).

PRIMARY OR PREEXPOSURE VACCINATION

Preexposure vaccination should be offered to persons in high-risk groups, such as veterinarians, animal handlers, and certain laboratory workers. Preexposure vaccination also should be considered for other persons whose activities bring them into frequent contact with rabies virus or potentially rabid bats, raccoons, skunks, cats, dogs, or other species at risk for having rabies. In addition, international travelers might be candidates for preexposure vaccination if they are likely to come in contact with animals in areas where dog rabies is enzootic and immediate access to appropriate medical care, including biologics, might be limited. Routine preexposure prophylaxis for other situations might not be indicated (*33,34*). Preexposure prophylaxis is administered for several reasons. First, although preexposure vaccination does not eliminate the need for additional therapy after a rabies exposure, it simplifies therapy by eliminating the need for RIG and decreasing the number of doses of vaccine needed — a point of particular importance for persons at high risk for being exposed to rabies in areas where immunizing products might not be available or where they might be at high risk for adverse reactions. Second, preexposure prophylaxis might protect persons whose postexposure therapy is delayed. Finally, it might provide protection to persons at risk for inapparent exposures to rabies.

Intramuscular Primary Vaccination

Three 1.0-mL injections of HDCV, RVA, or PCEC should be administered intramuscularly (deltoid area) — one injection per day on days 0, 7, and 21 or 28 (Table 2). In a study in the United States, >1,000 persons received HDCV according to this regimen. Antibody was found in serum samples of all subjects when tested by the rapid fluorescent focus inhibition test (RFFIT). Studies with other products have produced comparable results (*21,35–39*).

Intradermal Primary Vaccination

A regimen of three 0.1-mL ID doses of HDCV, one each on days 0, 7, and 21 or 28, is also used for preexposure vaccination (Table 2) as an alternative to the 1.0-mL IM regimen for rabies preexposure prophylaxis with HDCV (*8,21,22,24,35–37,40*). A single dose of lyophilized HDCV (Imovax® Rabies I.D.) is available prepackaged for reconstitution in the syringe just before administration. The syringe is designed to deliver 0.1 mL of HDCV reliably and has been approved by the FDA since 1986 (*25*).

TABLE 2. Rabies preexposure prophylaxis schedule — United States, 1999

Type of vaccination	Route	Regimen
Primary	Intramuscular	HDCV, PCEC or RVA; 1.0 mL (deltoid area), one each on days 0,* 7, and 21 or 28
	Intradermal	HDCV; 0.1 mL, one each on days 0,* 7, and 21 or 28
Booster	Intramuscular	HDCV, PCEC, or RVA; 1.0 mL (deltoid area), day 0* only
	Intradermal	HDCV; 0.1 mL, day 0* only

HDCV=human diploid cell vaccine; PCEC=purified chick embryo cell vaccine; RVA=rabies vaccine adsorbed.
*Day 0 is the day the first dose of vaccine is administered.

The 0.1-mL ID doses, administered in the area over the deltoid (lateral aspect of the upper arm) on days 0, 7, and 21 or 28, are used for primary preexposure vaccination. One 0.1-mL ID dose is used for routine preexposure booster vaccination (Table 2). The 1.0-mL vial is not approved for multidose ID use. RVA and PCEC are not approved for and should not be administered intradermally (*26*).

When chloroquine phosphate was used routinely for malaria prophylaxis, investigators discovered that the drug decreased the antibody response to concomitantly administered HDCV (*41*). Although interference with the immune response to rabies vaccine by other antimalarials structurally related to chloroquine (e.g., mefloquine) has not been evaluated, precautions for persons receiving these drugs should be followed. Accordingly, HDCV should not be administered intradermally to a person traveling to malaria-endemic countries while the person is receiving one of these antimalarials (*42*). The IM administration of three doses of 1.0 mL of vaccine for preexposure prophylaxis provides a sufficient margin of safety in this situation (*42*). For persons who will be receiving both rabies preexposure prophylaxis and antimalarial chemoprophylaxis in preparation for travel to a rabies-enzootic area, the ID regimen should be initiated at least 1 month before travel to allow for completion of the full three-dose vaccine series before antimalarial prophylaxis begins. If this schedule is not possible, the IM regimen should be used.

Preexposure Booster Doses of Vaccine

Persons who work with rabies virus in research laboratories or vaccine production facilities (continuous risk category [Table 3] [*43*]) are at the highest risk for inapparent exposures. Such persons should have a serum sample tested for rabies antibody every 6 months. Booster doses (IM or ID [Table 2]) of vaccine should be administered to maintain a serum titer corresponding to at least complete neutralization at a 1:5 serum dilution by the RFFIT. The frequent-risk category includes other laboratory workers (e.g., those performing rabies diagnostic testing), spelunkers, veterinarians and staff, and animal-control and wildlife officers in areas where animal rabies is enzootic. Persons in this group should have a serum sample tested for rabies antibody every 2 years; if the titer is less than complete neutralization at a 1:5 serum dilution by the RFFIT, the person also should receive a single booster dose of vaccine. Veterinarians, veterinary students, and animal-control and wildlife officers working in areas

TABLE 3. Rabies preexposure prophylaxis guide — United States, 1999

Risk category	Nature of risk	Typical populations	Preexposure recommendations
Continuous	Virus present continuously, often in high concentrations. Specific exposures likely to go unrecognized. Bite, nonbite, or aerosol exposure.	Rabies research laboratory workers;* rabies biologics production workers.	Primary course. Serologic testing every 6 months; booster vaccination if antibody titer is below acceptable level.†
Frequent	Exposure usually episodic, with source recognized, but exposure also might be unrecognized. Bite, nonbite, or aerosol exposure.	Rabies diagnostic lab workers,* spelunkers, veterinarians and staff, and animal-control and wildlife workers in rabies-enzootic areas.	Primary course. Serologic testing every 2 years; booster vaccination if antibody titer is below acceptable level.†
Infrequent (greater than population at large)	Exposure nearly always episodic with source recognized. Bite or nonbite exposure.	Veterinarians and animal-control and wildlife workers in areas with low rabies rates. Veterinary students. Travelers visiting areas where rabies is enzootic and immediate access to appropriate medical care including biologics is limited.	Primary course. No serologic testing or booster vaccination.
Rare (population at large)	Exposure always episodic with source recognized. Bite or nonbite exposure.	U.S. population at large, including persons in rabies-epizootic areas.	No vaccination necessary.

* Judgment of relative risk and extra monitoring of vaccination status of laboratory workers is the responsibility of the laboratory supervisor (*43*).

† Minimum acceptable antibody level is complete virus neutralization at a 1:5 serum dilution by the rapid fluorescent focus inhibition test. A booster dose should be administered if the titer falls below this level.

with low rabies rates (infrequent exposure group) and at-risk international travelers do not require routine preexposure booster doses of vaccine after completion of primary preexposure vaccination.

Postexposure Therapy for Previously Vaccinated Persons

If exposed to rabies, previously vaccinated persons should receive two IM doses (1.0 mL each) of vaccine, one immediately and one 3 days later. Previously vaccinated persons are those who have received one of the recommended preexposure or postexposure regimens of HDCV, RVA, or PCEC, or those who received another vaccine and had a documented rabies antibody titer. RIG is unnecessary and should not be administered to these persons because an anamnestic response will follow the administration of a booster regardless of the prebooster antibody titer (*44*).

Preexposure Vaccination and Serologic Testing

Because the antibody response has been satisfactory after these recommended preexposure prophylaxis vaccine regimens, routine serologic testing to confirm seroconversion is not necessary except for persons suspected of being immunosuppressed. Patients who are immunosuppressed by disease or medications should postpone preexposure vaccinations and consider avoiding activities for which rabies preexposure prophylaxis is indicated. When that is not possible, immunosuppressed persons who are at risk for exposure to rabies should be vaccinated and their antibody titers checked. In these cases, failures to seroconvert after the third dose should be managed in consultation with appropriate public health officials.

POSTEXPOSURE PROPHYLAXIS

Rationale for Treatment

Administration of rabies postexposure prophylaxis is a medical urgency, not a medical emergency. Physicians should evaluate each possible exposure to rabies and, if necessary, consult with local or state public health officials regarding the need for rabies prophylaxis (Table 4). In the United States, the following factors should be considered before specific antirabies postexposure prophylaxis is initiated.

TABLE 4. Rabies postexposure prophylaxis guide — United States, 1999

Animal type	Evaluation and disposition of animal	Postexposure prophylaxis recommendations
Dogs, cats, and ferrets	Healthy and available for 10 days observation	Persons should not begin prophylaxis unless animal develops clinical signs of rabies.*
	Rabid or suspected rabid	Immediately vaccinate.
	Unknown (e.g., escaped)	Consult public health officials.
Skunks, raccoons, foxes and most other carnivores; bats	Regarded as rabid unless animal proven negative by laboratory tests†	Consider immediate vaccination.
Livestock, small rodents, lagomorphs (rabbits and hares), large rodents (woodchucks and beavers), and other mammals	Consider individually.	Consult public health officials. Bites of squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice, other small rodents, rabbits, and hares almost never require antirabies postexposure prophylaxis.

* During the 10-day observation period, begin postexposure prophylaxis at the first sign of rabies in a dog, cat, or ferret that has bitten someone. If the animal exhibits clinical signs of rabies, it should be euthanized immediately and tested.

† The animal should be euthanized and tested as soon as possible. Holding for observation is not recommended. Discontinue vaccine if immunofluorescence test results of the animal are negative.

Types of Exposure

Rabies is transmitted only when the virus is introduced into bite wounds or open cuts in skin or onto mucous membranes. If no exposure has occurred (i.e., no bite or nonbite exposure), postexposure prophylaxis is not necessary. The likelihood of rabies infection varies with the nature and extent of exposure. Two categories of exposure — bite and nonbite — should be considered.

Bite

Any penetration of the skin by teeth constitutes a bite exposure. All bites, regardless of location, represent a potential risk of rabies transmission. Bites by some animals, such as bats, can inflict minor injury and thus be undetected (*45*).

Nonbite

Nonbite exposures from terrestrial animals rarely cause rabies. However, occasional reports of transmission by nonbite exposure suggest that such exposures constitute sufficient reason to consider postexposure prophylaxis (*46*). The nonbite exposures of highest risk appear to be among persons exposed to large amounts of aerosolized rabies virus and surgical recipients of corneas transplanted from patients who died of rabies. Two cases of rabies have been attributed to probable aerosol exposures in laboratories, and two cases of rabies have been attributed to possible airborne exposures in caves containing millions of free-tailed bats (Tadarida brasiliensis) in the Southwest (*47*–*51*).

The contamination of open wounds, abrasions, mucous membranes, or theoretically, scratches, with saliva or other potentially infectious material (such as neural tissue) from a rabid animal also constitutes a nonbite exposure. Other contact by itself, such as petting a rabid animal and contact with blood, urine, or feces (e.g., guano) of a rabid animal, does not constitute an exposure and is not an indication for prophylaxis. Because the rabies virus is inactivated by desiccation and ultraviolet irradiation, in general, if the material containing the virus is dry, the virus can be considered noninfectious.

Human-to-Human Transmission

Human-to-human transmission has occurred among eight recipients of transplanted corneas. Investigations revealed each of the donors had died of an illness compatible with or proven to be rabies (*52*–*58*). The eight cases occurred in five countries: Thailand (two cases), India (two cases), Iran (two cases), the United States (one case), and France (one case). Stringent guidelines for acceptance of donor corneas have been implemented to reduce this risk.

Apart from corneal transplants, bite and nonbite exposures inflicted by infected humans could theoretically transmit rabies, but no laboratory-diagnosed cases occurring under such situations have been documented (*59*). Two nonlaboratory-confirmed cases of human-to-human rabies transmission in Ethiopia have been described (*60*). The reported route of exposure in both cases was direct salivary contact from another human (a bite and a kiss). Routine delivery of health care to a patient with rabies is not an indication for postexposure prophylaxis unless exposure of mucous membranes or nonintact skin to potentially infectious body fluids has occurred. Adherence to

standard precautions as outlined by the Hospital Infection Control Practices Advisory Committee will minimize the risk of exposure (*61*).

Animal Rabies Epidemiology and Evaluation of Involved Species

Bats

Rabid bats have been documented in the 49 continental states, and bats are increasingly implicated as important wildlife reservoirs for variants of rabies virus transmitted to humans (*1*). Recent epidemiologic data suggest that transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats (*5,6,62*). The limited injury inflicted by a bat bite (in contrast to lesions caused by terrestrial carnivores) and an often inaccurate recall of the exact exposure history might limit the ability of health-care providers to determine the risk of rabies resulting from an encounter with a bat (*45*). Human and domestic animal contact with bats should be minimized, and bats should never be handled by untrained and unvaccinated persons or be kept as pets (*6,63*).

In all instances of potential human exposures involving bats, the bat in question should be safely collected, if possible, and submitted for rabies diagnosis. Rabies postexposure prophylaxis is recommended for all persons with bite, scratch, or mucous membrane exposure to a bat, unless the bat is available for testing and is negative for evidence of rabies. Postexposure prophylaxis might be appropriate even if a bite, scratch, or mucous membrane exposure is not apparent when there is reasonable probability that such exposure might have occurred.

On the basis of the available but sometimes conflicting information from the 21 bat-associated cases of human rabies reported since 1980, in 1–2 cases, a bite was reported; in 10–12 cases, apparent contact occurred but no bite was detected; and in 7–10 cases, no exposure to bats was reported, but an undetected or unreported bat bite remains the most plausible hypothesis. Clustering of bat-associated human cases within the same household has never been reported.

Consequently, postexposure prophylaxis should be considered when direct contact between a human and a bat has occurred, unless the exposed person can be certain a bite, scratch, or mucous membrane exposure did not occur. In instances in which a bat is found indoors and there is no history of bat-human contact, the likely effectiveness of postexposure prophylaxis must be balanced against the low risk such exposures appear to present. In this setting, postexposure prophylaxis can be considered for persons who were in the same room as the bat and who might be unaware that a bite or direct contact had occurred (e.g., a sleeping person awakens to find a bat in the room or an adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person) and rabies cannot be ruled out by testing the bat. Postexposure prophylaxis would not be warranted for other household members.

Wild Terrestrial Carnivores

Raccoons, skunks, foxes, and coyotes are the terrestrial animals most often infected with rabies. All bites by such wildlife must be considered possible exposures to the rabies virus. Postexposure prophylaxis should be initiated as soon as possible after patients are exposed to wildlife unless the animal has already been tested and shown not to be rabid. If postexposure prophylaxis has been initiated and subsequent

immunofluorescence testing shows that the exposing animal was not rabid, postexposure prophylaxis can be discontinued.

Signs of rabies among wildlife cannot be interpreted reliably; therefore, any such animal that exposes a person should be euthanized at once (without unnecessary damage to the head) and the brain should be submitted for rabies testing (*64*). If the results of testing are negative by immunofluorescence, the saliva can be assumed to contain no virus, and the person bitten does not require postexposure prophylaxis.

Other Wild Animals

Small rodents (e.g., squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, and mice) and lagomorphs (including rabbits and hares) are almost never found to be infected with rabies and have not been known to transmit rabies to humans. From 1990 through 1996, in areas of the country where raccoon rabies was enzootic, woodchucks accounted for 93% of the 371 cases of rabies among rodents reported to CDC (*1,65,66*). In all cases involving rodents, the state or local health department should be consulted before a decision is made to initiate antirabies postexposure prophylaxis (*67*).

The offspring of wild animals crossbred to domestic dogs and cats (wild animal hybrids) are considered wild animals by the National Association of State and Public Health Veterinarians (NASPHV) and the Council of State and Territorial Epidemiologists (CSTE). Because the period of rabies virus shedding in these animals is unknown, these animals should be euthanized and tested rather than confined and observed when they bite humans. Wild animals and wild animal hybrids should not be kept as pets (*63*). Animals maintained in United States Department of Agriculturelicensed research facilities or accredited zoological parks should be evaluated on a case-by-case basis.

Domestic Dogs, Cats, and Ferrets

The likelihood of rabies in a domestic animal varies by region; hence, the need for postexposure prophylaxis also varies. In the continental United States, rabies among dogs is reported most commonly along the United States-Mexico border and sporadically in areas of the United States with enzootic wildlife rabies. During most of the 1990s, more cats than dogs were reported rabid in the United States. The majority of these cases were associated with the epizootic of rabies among raccoons in the eastern United States. The large number of rabies-infected cats might be attributed to fewer cat vaccination laws, fewer leash laws, and the roaming habits of cats. In many developing countries, dogs are the major vector of rabies; exposures to dogs in such countries represent an increased risk of rabies transmission.

On the basis of new information regarding rabies pathogenesis and viral shedding patterns in ferrets, ferrets are now considered in this category with dogs and cats rather than as wild terrestrial carnivores (*68*). A healthy domestic dog, cat, or ferret that bites a person may be confined and observed for 10 days. Any illness in the animal during confinement or before release should be evaluated by a veterinarian and reported immediately to the local public health department. If signs suggestive of rabies develop, the animal should be euthanized and its head removed and shipped, under refrigeration, for examination by a qualified laboratory. If the biting animal is stray or unwanted, it

should either be observed for 10 days or be euthanized immediately and submitted for rabies examination (*63*).

Circumstances of Biting Incident and Vaccination Status of Exposing Animal

An unprovoked attack by an animal is more likely than a provoked attack to indicate that the animal is rabid. Bites inflicted on a person attempting to feed or handle an apparently healthy animal should generally be regarded as provoked. A currently vaccinated dog, cat, or ferret is unlikely to become infected with rabies (*68*–*71*).

Treatment of Wounds and Immunization

The essential components of rabies postexposure prophylaxis are wound treatment and, for previously unvaccinated persons, the administration of both RIG and vaccine (Table 5 [*72*]). Persons who have been bitten by animals suspected or proven to be rabid should begin postexposure prophylaxis immediately. Incubation periods of >1 year have been reported in humans (*73*). Thus, when a documented or likely exposure has occurred, postexposure prophylaxis is indicated regardless of the length of the delay, provided the clinical signs of rabies are not present. In 1977, the World Health Organization recommended a regimen of RIG and six doses of HDCV over a 90-day period. This recommendation was based on studies in Germany and Iran (*14,18*). When used this way, the vaccine was found to be safe and effective in protecting persons bitten by animals proven to be rabid and induced an excellent antibody response in all recipients (*14*). Studies conducted in the United States by CDC have documented that a regimen of one dose of RIG and five doses of HDCV over a 28-day period was safe and induced an excellent antibody response in all recipients (*13*). Clinical trials with RVA and PCEC have demonstrated immunogenicity equivalent to that of HDCV (*26,74*).

Treatment of Wounds

Immediate and thorough washing of all bite wounds and scratches with soap and water and a virucidal agent such as a povidone-iodine solution irrigation are important measures for preventing rabies (*72*). In studies of animals, thorough wound cleansing alone without other postexposure prophylaxis has been shown to reduce markedly the likelihood of rabies (*75,76*). Tetanus prophylaxis and measures to control bacterial infection also should be administered as indicated (*77*). The decision to suture large wounds should take into account cosmetic factors and the potential for bacterial infections.

Immunization

Postexposure antirabies vaccination should always include administration of both passive antibody and vaccine, with the exception of persons who have previously received complete vaccination regimens (preexposure or postexposure) with a cell culture vaccine or persons who have been vaccinated with other types of vaccines and have had documented rabies antibody titers. These persons should receive only vaccine (see Postexposure Therapy for Previously Vaccinated Persons). The combination of RIG and vaccine is

TABLE 5. Rabies postexposure prophylaxis schedule — United States, 1999

Vaccination status	Treatment	Regimen*
Not previously vaccinated	Wound cleansing	All postexposure treatment should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as a povidone-iodine solution should be used to irrigate the wounds (*72*).
	RIG	Administer 20 IU/kg body weight. If anatomically feasible, **the full dose** should be infiltrated around the wounds(s) and any remaining volume should be administered IM at an anatomical site distant from vaccine administration. Also, RIG should not be administered in the same syringe as vaccine. Because RIG might partially suppress active production of antibody, no more than the recommended dose should be given.
	Vaccine	HDCV, RVA, or PCEC 1.0 mL, IM (deltoid area†), one each on days 0§, 3, 7, 14, and 28.
Previously vaccinated¶	Wound cleansing	All postexposure treatment should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as a povidone-iodine solution should be used to irrigate the wounds (*72*).
	RIG	RIG should **not** be administered.
	Vaccine	HDCV, RVA, or PCEC 1.0 mL, IM (deltoid area†), one each on days 0§ and 3.

HDCV=human diploid cell vaccine; PCEC=purified chick embryo cell vaccine; RIG=rabies immune globulin; RVA=rabies vaccine adsorbed; IM, intramuscular.

* These regimens are applicable for all age groups, including children.

† The deltoid area is the only acceptable site of vaccination for adults and older children. For younger children, the outer aspect of the thigh may be used. Vaccine should never be administered in the gluteal area.

§ Day 0 is the day the first dose of vaccine is administered.

¶ Any person with a history of preexposure vaccination with HDCV, RVA or PCEC; prior postexposure prophylaxis with HDCV, RVA, or PCEC; or previous vaccination with any other type of rabies vaccine and a documented history of antibody response to the prior vaccination.

recommended for both bite and nonbite exposures (see Rationale for Treatment), regardless of the interval between exposure and initiation of treatment.

Rabies Immune Globulin Use. RIG is administered only once (i.e., at the beginning of antirabies prophylaxis) to previously unvaccinated persons to provide immediate antibodies until the patient responds to HDCV, RVA, or PCEC by actively producing antibodies. If RIG was not administered when vaccination was begun, it can be administered through the seventh day after the administration of the first dose of vaccine (*78*). Beyond the seventh day, RIG is not indicated since an antibody response to cell culture vaccine is presumed to have occurred. Because RIG can partially suppress active production of antibody, no more than the recommended dose should be administered (*79*). The recommended dose of human RIG is 20 IU/kg body weight. This formula is applicable to all age groups, including children. If anatomically feasible, the full dose of RIG should be thoroughly infiltrated in

the area around and into the wounds. Any remaining volume should be injected intramuscularly at a site distant from vaccine administration. This change in the recommendations for RIG administration is based on reports of rare failures of postexposure prophylaxis when smaller amounts of RIG were infiltrated at the exposure sites (*80*). RIG should never be administered in the same syringe or in the same anatomical site as vaccine.

Vaccine Use. Three rabies vaccines are currently available in the United States (Table 1); any one of the three can be administered in conjunction with RIG at the beginning of postexposure therapy. A regimen of five 1-mL doses of HDCV, RVA, or PCEC should be administered intramuscularly. The first dose of the five-dose course should be administered as soon as possible after exposure. Additional doses should be administered on days 3, 7, 14, and 28 after the first vaccination. For adults, the vaccination should always be administered IM in the deltoid area. For children, the anterolateral aspect of the thigh is also acceptable. The gluteal area should never be used for HDCV, RVA, or PCEC injections because administration of HDCV in this area results in lower neutralizing antibody titers (81).

Treatment Outside the United States

U.S. citizens who are exposed to rabies while traveling outside the United States in countries where rabies is enzootic might sometimes receive postexposure therapy with regimens or biologics that are not used in the United States (Table 6). This information is provided to familiarize physicians with some of the regimens used more widely abroad. The regimens described in the references in this report have not been submitted for approval by the FDA for use in the United States (*82*–*93*). If postexposure prophylaxis is begun outside the United States using one of these regimens or biologics of nerve tissue origin, it might be necessary to provide additional therapy when the patient reaches the United States. State or local health departments should be contacted for specific advice in such cases. If titers are obtained, specimens collected 2–4 weeks after preexposure or postexposure prophylaxis should completely neutralize challenge virus at a 1:5 serum dilution by the RFFIT.

Purified equine rabies immune globulin (ERIG) has been used effectively in developing countries where RIG might not have been available. The incidence of adverse reactions has been low (0.8%–6.0%), and most of those that occurred were minor (*94*–*96*). In addition, unpurified antirabies serum of equine origin might still be used in some countries where neither RIG nor ERIG are available. The use of this antirabies serum is associated with higher rates of serious adverse reactions, including anaphylaxis (*97*).

TABLE 6. Cell culture rabies vaccines widely available outside the United States

Purified chick embryo cell vaccine (PCEC)	Rabipur®
Purified vero cell rabies vaccine (PVRV)	Verorab™ Imovax – Rabies vero™ TRC Verorab™
Human diploid cell vaccine (HDCV)	Rabivac™
Purified duck embryo vaccine (PDEV)	Lyssavac N™

Although no postexposure vaccine failures have occurred in the United States since cell culture vaccines have been routinely used, failures have occurred abroad when some deviation was made from the recommended postexposure treatment protocol or when less than the currently recommended amount of antirabies sera was administered (*80,98–100*). Specifically, patients who contracted rabies after postexposure prophylaxis did not have their wounds cleansed with soap and water, did not receive their rabies vaccine injections in the deltoid area (i.e., vaccine was administered in the gluteal area), or did not receive RIG around the wound site.

VACCINATION AND SEROLOGIC TESTING

Serologic Response Shortly After Vaccination

All persons tested during several CDC studies 2–4 weeks after completion of preexposure and postexposure rabies prophylaxis in accordance with ACIP guidelines have demonstrated an antibody response to rabies (*13,38,101,102*). Therefore, serum samples from patients completing preexposure or postexposure prophylaxis do not need to be tested to document seroconversion unless the person is immunosuppressed (see Precautions and Contraindications). If titers are obtained, specimens collected 2–4 weeks after preexposure or postexposure prophylaxis should completely neutralize challenge virus at a 1:5 serum dilution by the RFFIT. In animal studies, neutralizing antibody titers have been shown to be imperfect markers of protection. Antibody titers will vary with time since the last vaccination. Differences among laboratories that test blood samples also can influence the results.

Cell culture vaccines have been used effectively with RIG or ERIG worldwide to treat persons bitten by various rabid animals (*13,14*). Worldwide, the World Health Organization estimates that 10–12 million persons are started on postexposure therapy annually (*74*). An estimated 16,000–39,000 persons in the United States receive a full postexposure course with HDCV each year (*7*). When postexposure prophylaxis has been properly administered, no treatment failures have occurred in the United States.

Serologic Response and Preexposure Booster Doses of Vaccine

Although antibody levels do not define a person's immune status, they are a marker of continuing immune response (*103*). To ensure the continuity of an immune response, titers should be checked periodically, with booster doses administered as needed. Two years after primary preexposure vaccination, a 1:5 serum dilution will neutralize challenge virus completely (by the RFFIT) among 93%–98% of persons who received the three-dose preexposure series intramuscularly and 83%–95% of persons who received the three-dose series intradermally (*104*). If the titer falls below the minimum acceptable antibody level, a preexposure booster dose of vaccine is recommended for a person at continuous or frequent risk for exposure to rabies (Table 3). The following guidelines are recommended for determining when serum testing should be performed after primary preexposure vaccination:

- A person in the continuous-risk category (Table 3) should have a serum sample tested for rabies antibody every 6 months (*43*).

- A person in the frequent-risk category (Table 3) should have a serum sample tested for rabies antibody every 2 years (*105*).

State or local health departments can provide the names and addresses of laboratories performing rabies serologic testing.

ADVERSE REACTIONS

HDCV, RVA, and PCEC

Reactions after vaccination with HDCV, RVA, and PCEC are less serious and less common than with previously available vaccines (*74,106,107*). In previous studies with HDCV, local reactions (e.g., pain, erythema, and swelling or itching at the injection site) have been reported among 30%–74% of recipients (*108*). Systemic reactions (e.g., headache, nausea, abdominal pain, muscle aches, and dizziness) have been reported among 5%–40% of recipients. Three cases of neurologic illness resembling Guillain-Barré syndrome that resolved without sequelae in 12 weeks have been reported (*8,109,110).* In addition, other central and peripheral nervous system disorders have been temporally associated with HDCV vaccine, but a causal relationship has not been established in these rare reports (*111*).

An immune complex-like reaction occurred among approximately 6% of persons who received booster doses of HDCV 2–21 days after administration of the booster dose (*9,10*). The patients developed generalized urticaria, sometimes accompanied by arthralgia, arthritis, angioedema, nausea, vomiting, fever, and malaise. In no cases have these reactions been life-threatening. This reaction occurred less frequently among persons receiving primary vaccination. The reactions have been associated with the presence of betapropiolactone-altered human albumin in the HDCV and the development of immunoglobulin E (IgE) antibodies to this allergen (*112–114*).

Rabies Immune Globulin (Human)

Local pain and low-grade fever might follow receipt of RIG. Although not reported specifically for RIG, angioneurotic edema, nephrotic syndrome, and anaphylaxis have been reported after injection of immune globulin (IG), a product similar in biochemical composition but without antirabies activity. These reactions occur so rarely that a causal relationship between IG and these reactions has not been established. Both formulations of RIG, BayRab™ and Imogam®Rabies-HT, undergo multiple viral clearance procedures during preparation. There is no evidence that any viruses have ever been transmitted by commercially available RIG in the United States.

Vaccines and Immune Globulins Used in Other Countries

Many developing countries use inactivated nerve tissue vaccines made from the brains of adult animals or suckling mice. Nerve tissue vaccine (NTV) is reported to induce neuroparalytic reactions among approximately 1 per 200 to 1 per 2,000

persons vaccinated; suckling mouse brain vaccine (SMBV) causes reactions in approximately 1 per 8,000 persons vaccinated (*15,115*). The vaccines HDCV, PCEC, PDEV, and purified vero cell rabies vaccine (PVRV) (Table 6) are cell culture-derived and not of nerve tissue origin. In addition, unpurified antirabies serum of equine origin might still be used in some countries where neither RIG nor ERIG are available. The use of this antirabies serum is associated with higher rates of serious adverse reactions, including anaphylaxis.

Management of Adverse Reactions

Once initiated, rabies prophylaxis should not be interrupted or discontinued because of local or mild systemic adverse reactions to rabies vaccine. Usually, such reactions can be successfully managed with antiinflammatory and antipyretic agents, such as ibuprofen or acetaminophen.

When a person with a history of serious hypersensitivity to rabies vaccine must be revaccinated, antihistamines can be administered. Epinephrine should be readily available to counteract anaphylactic reactions, and the person should be observed carefully immediately after vaccination.

Although serious systemic, anaphylactic, or neuroparalytic reactions are rare during and after the administration of rabies vaccines, such reactions pose a serious dilemma for the patient and the attending physician (*9*). A patient's risk of acquiring rabies must be carefully considered before deciding to discontinue vaccination. Advice and assistance on the management of serious adverse reactions for persons receiving rabies vaccines may be sought from the state health department or CDC.

All serious systemic, neuroparalytic, or anaphylactic reactions should be reported to the Vaccine Adverse Event Reporting System (VAERS) via a 24-hour toll-free telephone number ([800] 822-7967).

PRECAUTIONS AND CONTRAINDICATIONS

Immunosuppression

Corticosteroids, other immunosuppressive agents, antimalarials, and immuno-suppressive illnesses can interfere with the development of active immunity after vaccination (*41,116*). For persons with immunosuppression, preexposure prophylaxis should be administered with the awareness that the immune response might be inadequate (see Primary or Preexposure Vaccination). Patients who are immuno-suppressed by disease or medications should postpone preexposure vaccinations and consider avoiding activities for which rabies preexposure prophylaxis is indicated. When this course is not possible, immunosuppressed persons who are at risk for rabies should be vaccinated by the IM route and their antibody titers checked. Failure to seroconvert after the third dose should be managed in consultation with appropriate public health officials (see Preexposure Vaccination and Serologic Testing).

Immunosuppressive agents should not be administered during postexposure therapy unless essential for the treatment of other conditions. When postexposure prophylaxis is administered to an immunosuppressed person, it is especially important that a serum

[sample be tested for rabies antibody to ensure that an acceptable antibody response has developed.

Pregnancy

Because of the potential consequences of inadequately treated rabies exposure, and because there is no indication that fetal abnormalities have been associated with rabies vaccination, pregnancy is not considered a contraindication to postexposure prophylaxis (*117,118*). If the risk of exposure to rabies is substantial, preexposure prophylaxis might also be indicated during pregnancy.

Allergies

Persons who have a history of serious hypersensitivity to rabies vaccine should be revaccinated with caution (see Management of Adverse Reactions).

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RABIES ANTIBODY TESTING
RAPID FLUORESCENT FOCUS INHIBITION TEST - RFFIT
Humans and Animals

ATLANTA HEALTH ASSOCIATES was established in 1993 by the late Keith Sikes, D.V.M., M.P.H. and Mary Yager, B.S. Since that time the laboratory in Cumming, GA has offered the rabies viral neutralization (RFFIT) test for both human and animal specimens. This licensed facility is under the directorship of Richard H. Newhouse, Ph.D.

COST OF TESTS

Screen:	$23.00 $20.00 (10 or more serums)	Serum tested at two dilutions	To determine if booster dose is needed
End Point:	$30.00 (humans) $35.00 (animals)	Serum tested at serial 5 fold dilutions until an end point is reached	To determine a more exact titer

TITER INTERPRETATION

- A titer $\geq$ 0.5 International Units (IU) indicates a positive antibody response to rabies vaccination. Both the World Health Organization's Expert Rabies Committee and the USPHS Advisory Committee on Immunization Practices agree on this interpretation.
- A titer of < 0.5 IU indicates a need for a booster dose of vaccine.
- Results will be mailed within seven days after the serum is received. Results can be provided by fax or telephone if requested.

SHIPPING

- After centrifugation please transfer 2 ml serum from vacutainer tube to plastic leak-proof container. Send refrigerated serum and all copies of the attached form to the above address.
- If the form is not available, please provide the name and vaccination history for each specimen submitted as well as the name and address of the person to whom results should be sent.

PAYMENT

- Institutions should provide a purchase order number and billing address with specimens.
- Individuals should include a personal check or money order made payable to Atlanta Health Associates, Inc.

Atlanta Health Associates, Inc.
309 Pirkle Ferry Road, Suite D300
Cumming, GA 30040

(770) 205-9091
(800) 717-5612
Fax (770) 205-9021

Request for Rabies RFFIT Serology

Address for Results _____

_____

_____

_____

Attention: _____

Telephone #: _____

Fax #: _____

Costs

Screen:
$23.00
$20.00 (10 or more)

End Point:

$30.00 - human
$35.00 - animal

Billing

- Individuals — Please enclose check or money order made payable to Atlanta Health Associates, Inc.
- Institutions — Please provide a P.O.# and billing address

Shipping

- After centrifugation please transfer 2 ml serum from vacutainer tube to plastic leak-proof container. Send refrigerated serum and all copies of this form to the above address.
- Deliveries cannot be accepted on weekends and holidays.

Name (animals being exported must include microchip #)	**Specimen Date**	**Vaccination History**	**Test Results**	**Lab Use**

Test Interpretation

- A titer $\geq$ 0.5 International Units (IU) indicates a positive antibody response to rabies vaccination. If the titer is less than 0.5 IU, a booster dose of rabies vaccine is indicated.

CLIA ID # I ID0883358
Richard H. Newhouse, PhD, Laboratory Director

RAPID FLUORESCENT FOCUS INHIBITION TEST (RFFIT)

For the quantitization of antibody level to rabies virus in humans and animals.

TYPES OF ASSAYS:	Kansas State University will conduct one of two types of RFFIT depending upon your request.
1. Screen	Serum diluted 1:5 and 1:50. Results reported as one of the following: 1:5 or >1:50. For those who want to know if they need a booster of rabies vaccine. Cost: $24.00 (1-9 samples); $20.00 (10+ samples)
2. Endpoint	Serum is initially diluted at 1:5 and then in 5-fold increments until an endpoint is reached. For those who want to know their exact titer and for animals being exported to rabies free countries. Cost: $27.00 (1-9 samples); $25.00 (10+ samples)
SPECIMEN REQUIREMENTS:	Approximately 2ml of serum, without preservatives, is required for either test.
INTERPRETATION:	HUMANS: A 1:5 is considered to be an adequate titer. ANIMALS: The World Health Organization (WHO) recommends that felines and canines being exported to a "rabies free" country have a minimum titer of 0.5 international units (I.U.) using the RFFIT method.
PROCESSING TIME:	All RFFITs are initiated at 8:00 a.m. on Mondays and Thursdays. Results are ready on Tuesdays and Fridays. We will fax or telephone results upon request.
SHIPPING INFORMATION:	Serum should be removed from the clot and packed in a leak proof container with absorbent material. This package should be placed inside of a second container with ice packs or dry ice.
PAYMENT:	We prefer a P.O. # to accompany all specimens from an institution. Individuals responsible for payment should include a personal check or money order.
OTHER INFORMATION:	Please send the following information with your specimen: 3. Address of person responsible for receiving results and invoice. 4. Complete vaccination history of patient. 5. Date of birth and gender of patient.
SEND SAMPLES TO:	Dr. Deborah J. Briggs Department of Pathobiology/Diagnostic Medicine 1800 Denison Avenue Kansas State University Manhattan, Kansas 66506-5600 Attn: RFFIT

RABIES LABORATORY SPECIMEN RECEIVING PROTOCOL FOR LOCAL HEALTH DEPARTMENTS AND ANIMAL CONTROL OFFICES

The Division of Consolidated Laboratory Services (DCLS) has three rabies testing sites, which are located in Richmond, Luray, and Abingdon. There are also two independent local health departments, Fairfax and Norfolk, which perform rabies testing. **The following protocol is that of the DCLS only.**

GENERAL GOAL AND RESPONSIBILITY

DCLS provides rabies testing in support of a statewide effort to control the spread of rabies to domestic animals and humans. The laboratory is responsible for notifying the local health department or authorized submitting agency that supports the location where the animal was collected of the results of rabies testing. The responsibility of the local health department is the notification of persons who may have been exposed to the animal or who own animals that may have been exposed. When necessary the laboratory will also report results to the Virginia Department of Agriculture and Consumer Services (VDACS).

All positive results are telephoned directly to the local health department or authorized submitting agency.

SPECIMEN RECEIVING

Direct Delivery to Richmond Laboratory – (804)-786-5142

Specimens are accepted at the Richmond Laboratory between 8:15 A.M. and 5:00 P.M. on regular workdays. Specimens received by 11:00 A.M. weekdays will be tested and positive results called the same day.

Emergency testing is available on weekends and holidays on animals where there has been significant human exposure. For emergency specimens please call 804-418-9799. This is a pager number, and the on call staff person will return your call when you post a telephone number to the pager system. Specimens that are received by 9:00 A.M. on Saturdays and holidays will be tested and positive results called the same day.

The Richmond Laboratory will only accept animal heads or appropriate brain tissue with the exception of very small animals such as bats.

When the building is closed, delivery people must go to the second floor entrance. Please ring bell located on the right of the entrance door to notify security that a delivery person is waiting. The guard may be called prior to delivery to alert him that a person will need entrance to the building. The security guard's telephone number on the second floor receiving desk is (804) 786-1155. After hours specimens must be taken by the delivery person to the rabies refrigerator located in the 1st floor hallway and checked-in.

Delivery to Luray Laboratory- (540) 743-6326

Specimens are accepted by the Luray laboratory between 8:15 A.M. to 5:00 P.M. on regular workdays.

Emergency testing on weekends and holidays is performed by the person on-call. Please contact the Luray Laboratory personnel to arrange for emergency services.

The Luray Laboratory will only accept animal heads or appropriate brain tissue with the exception of very small animals such as bats.

Specimens delivered by courier are tested and positive results are called the same day.

Delivery to Abingdon Laboratory - (540) 676-5435

Specimens are accepted at the Abingdon laboratory from 8:15 A.M. to 5:00 P.M. on regular workdays.

Specimens may be delivered between 8:15 A.M. and 12:00 noon on Saturdays.

Emergency testing is available on weekends and holidays on animals where there has been significant human exposure. Emergency testing on weekends and holidays is performed by the person on-call.

The Abingdon Laboratory will only accept animal heads or appropriate brain tissue with the exception of very small animals such as bats.

Specimens delivered by courier are tested and positive results are called the same day.

SPECIMEN REQUIREMENTS

1. Specimens that should be tested are those in which there has been or may have been
   A. human or domestic animal exposure or
   B. when public health action may be taken. (refer to part IV. 'submission policy' on page 9 of Virginia Department of Health's Rabies Control guidelines for year 2000)

   Definitions:

   A.1. Significant human exposure is a skin-puncturing bite or saliva on a mucous membrane or saliva in a fresh skin penetrating wound.

   A.2. Domestic animal exposure is a dog, cat, or livestock that has been bitten or may have been bitten (a visible bite wound is not necessary) by a suspected rabid animal.

   A.3. Bats should be tested if there is any possibility of human exposure including a bat found in the room with an infant, a sleeping person or an incapacitated person.

A.4. Caged rodents such as hamsters, mice, and gerbils should not be submitted for rabies testing unless circumstances suggest rabies infection.

SPECIMEN SUBMISSION

1. Please collect and submit the specimen to the laboratory promptly to avoid submission of decomposed animals. Results of grossly decomposed animals may be reported as unsatisfactory for testing.

2. Keep the specimen cold but not frozen. A frozen specimen will delay testing until the specimen thaws which usually takes about a day.

3. All specimens should be sprayed or dusted for fleas and ticks.

4. Do not submit the entire body for rabies testing. Send only the head or brain tissue. **Exception:** The entire body of small mammals such as bats, mice, squirrels, etc may be submitted.

5. The specimen must be packaged to prevent leakage. Zip-lock bags placed in coolers are excellent to prevent leakage. Do not use wet ice when shipping specimens. Wet ice may leak. Use frozen cold packs only.

6. The outside of the container must not be contaminated therefore please clean the container with disinfectant.

RABIES REQUEST FORM

1. The request form must be completed to insure proper identification of the animal and timely notification of results.

2. In order for the laboratory to notify the health department of positive results on weekends and holidays, **AN EMERGENCY TELEPHONE NUMBER MUST BE ON THE REQUEST FORM.**

COMMONWEALTH of VIRGINIA

ROBERT B. STROUBE, M.D., M.P.H.
STATE HEALTH COMMISSIONER

Department of Health
P O BOX 2448
RICHMOND VA 23218

October 31, 1988

MEMORANDUM

TO: Regional Directors
District Directors at Headquarters and Branch Offices

Regional Sanitarians
District Sanitarians at Headquarters and Branch Offices

THROUGH: Robert B. Stroube, M.D., M.P.H.
Deputy Commissioner for Community Health Services

FROM: Suzanne R. Jenkins, V.M.D., M.P.H.
Assistant State Epidemiologist

SUBJECT: Memorandum of Understanding Regarding Rabies Specimens

The attached Memorandum of Understanding (MOU) is the product of numerous interdepartmental meetings which occurred in response to perceived problems in communication and coordination between the Animal Health Laboratories (AHL) of the Department of Agriculture and Consumer Services, the Rabies Laboratory (RL) of the Department of General Services and local health departments (LHD). It is the hope of the MOU committee (Drs. Friedman, Griffin, Givens, Bueschel and Mr. Redman of the Department of Agriculture and Consumer Services, Ms. Currin of the Department of General Services and me) that this MOU will clarify the roles of each agency, eliminate duplication of effort and most importantly improve the overall public health response in suspect rabies cases.

The AHL have agreed to remove the brain from all livestock presented to them. This means that sanitarians who find it convenient to take a head to an AHL will not have to ship an entire head to the RL or take the risk of trying to remove the brain themselves. The AHL have also agreed to decapitate any small animals (including wildlife) that are presented to them. It is assumed that if the LHD is presenting the animal, the sanitarian or animal control officer (acting as an agent of the LHD) will have completely filled out the laboratory submission form. All rabies suspect samples will be shipped by the AHL in

their routine shipping to Richmond except those from animals involved in human exposure or those that the LHD wants shipped in a more timely manner. Any time the AHL ships a specimen for rabies testing that has not been submitted by a LHD the AHL will telephone the LHD of the county from which the specimen originated to let them know a sample has been submitted from that county.

This arrangement should reduce the burden of extra pick up and delivery experienced by LHDs which are near an AHL. In addition, by having the AHL inform the LHD from which a rabies suspect originated, follow-up and case management should be more timely and efficient.

The willingness of the AHL to perform some functions (brain removal, decapitation and shipment of animals that are not part of their regular case load) is a kindness that I hope will not be abused. I strongly suggest that you establish open communication and a good working relationship with the AHL personnel in your area. Please be sure they are supplied with the names of key rabies people in the LHD and both the work and home phone numbers for these people. I have attached a list of the AHL for your use.

Please do not hesitate to contact me if you have any questions about this agreement.

sdp

Memorandum of Understanding
Between the
Department of Health
and the
Department of General Services
and the
Department of Agriculture & Consumer Services

This Memorandum of Understanding is made and entered into May 18, 1988 by and between C.M.G. Buttery, M.D., M.P.H., Commissioner of the Department of Health, W. L. Seldon, Director, Department of General Services and S. Mason Carbaugh, Commissioner of the Department of Agriculture and Consumer Services. The provisions of this document can be terminated by any of the parties by serving a written notice to all parties.

The purpose of this document is to set forth the responsibilities of each Department relative to the collection, submission and examination of samples from animals that are considered to be Rabies suspects and to provide the format for a cooperative effort between the working groups in implementing the diagnostic portion of the Rabies control program.

The Department of Agriculture and Consumer Services agrees to:

1. Prepare Rabies suspect specimens for submission to an appropriate laboratory of the Department of General Services as follows:
   a. Remove brain tissue from all heads from livestock and prepare for shipment in container supplied by Virginia Department of Health.
   b. Prepare for shipment all heads from small animals, e.g. dogs, cats, fox, raccoon, etc. in a container supplied by VDH.
   c. Handle in accordance with acceptable laboratory procedures those cases submitted to a Division of Animal Health Regional Diagnostic Laboratory which involve a differential diagnosis with Rabies as a possibility. Tissues will be shipped for Rabies examination by the laboratory that performed the necropsy or by the laboratory that accepted the tissues from clients for diagnostic purposes except in emergencies involving human exposure when Virginia Department of Health will be responsible for shipment.
2. Complete Department of General Services form "Rabies" DGS-22-173 in the following manner when specimen is generated from a Division of Animal Health Regional Diagnostic Laboratory (not from local Health Department):
   a. Provide all of the information requested on the top portion of the form plus that requested in sections I and II.
   b. In the space designated "Report to" place the submitting Veterinarian's name, if appropriate, or the name of the owner and the address of the owner.
   c. Under "Telephone Number" provide a daytime number and an after hour number for the submitting person designated in 2.b. above.
   d. Provide the name of the county from which the case originated in the appropriate space. This information is CRITICAL.
   e. Submit all copies of the DGS-22-173 form with the specimen. Keep a xerox copy for the laboratory suspense file.
3. When shipment of specimen is made, immediately notify the local Department of Health Officials in the county from which the animal originated in all suspected Rabies cases.

The Department of Health Responsibilities:

1. Local Health Department in the area of the Division of Animal Health Regional Diagnostic Laboratory will pick up Rabies suspect specimens from the diagnostic laboratory and arrange for delivery of same to the appropriate laboratory, when human exposure is involved.
2. Office of Epidemiology of Virginia Department of Health will supply to the Division of Animal Health Regional Diagnostic Laboratories, Department of Agriculture and Consumer Services, containers suitable for shipping suspect Rabies specimens between laboratories.
3. The Department of Health will supply to the Division of Animal Health Regional Diagnostic Laboratories a list of local Health Department offices.

The Department of General Services agrees to:

1. Examine all suspect animal brain tissues that meet standard Department of General Services criteria for acceptance for Rabies.
2. Report laboratory findings to the Division of Animal Health Regional Diagnostic Laboratory if requested, local Health Department, submitting veterinarian and Office of Epidemiology in accordance with the instructions on the submitting form (DGS-22-173 "Rabies").
3. Telephone all positive results to the local Health Department immediately and to the Division of Animal Health Regional Diagnostic Laboratory if requested.
4. Supply the DGS-22-173 form to Division of Animal Health Regional Diagnostic Laboratories that is used in submitting Rabies specimens.

SIGNED PURSUANT TO AUTHORITY
VESTED IN DEPUTY HEALTH COMMISSIONER
BY SEC. 1-22; Code of VA

C.M.G. Buttery, M.D., M.P.H.
Commissioner
Department of Health

Oct. 3, 1988
(Date)

W. L. Seldon
Director
Department of General Services

10 Oct 1988
(Date)

S. M. Carbaugh
Commissioner
Department of Agriculture & Consumer Services

9/27/88
(Date)

REGIONAL LABORATORIES

Location	Operating Hours (Monday thru Friday)	Telephone
Wytheville Regional Laboratory 250 Cassell Road Wytheville, Virginia 24382	7:45 a.m. - 4:30 p.m.	(540) 228-5501
Lynchburg Regional Laboratory 4832 Tyreeanna Road Lynchburg, Virginia 24504	7:45 a.m. - 4:30 p.m.	(804) 947-6731
Harrisonburg Regional Laboratory Harrisonburg Poultry Laboratory 116 Reservoir Street Harrisonburg, Virginia 22801	7:45 a.m. - 4:30 p.m.	(540) 434-3897
Warrenton Regional Laboratory 272 Academy Hill Road Warrenton, Virginia 22186	7:45 a.m. - 4:30 p.m.	(540) 347-6385
Ivor Regional Laboratory 34591 general Mahone Boulevard Ivor, Virginia 23866	7:45 a.m. - 4:30 p.m.	(757) 859-6221

COMMONWEALTH of VIRGINIA

C.M.G. BUTTERY, M.D.
COMMISSIONER

Department of Health
Richmond, Virginia 23219

Policy Instruction (PI): 5.13

Title: Collection and Submission of Rabies Specimens

Effective: August 1, 1987
Expires: On notification

I. Applicability: All district and local health departments.

II. Purpose and Background: The purpose of this PI is to define the responsibility of the local health department for the collection and submission of specimens to be tested for rabies. Rabies control activities are often performed by a variety of agencies and organizations. For instance, the capture of a suspected rabid animal may be done by a sanitarian, animal control officer, game warden, or policeman. Killing of the animal and removal and shipping of the head may be done by any of the previously mentioned or by a veterinarian. Because so many people can be involved in this process, there are times when communication and coordination have been poor and specimens have not been submitted in a timely and efficient manner. Customs and resources vary greatly from one jurisidiction to another; therefore it is not possible for a statewide policy to spell out exactly which agency or personnel should do which job. However, it is clear from the Code of Virginia (Section 29-213.68) that the ultimate responsibility for preventing human rabies lies with the Department of Health. Local health departments must do whatever is necessary to see that rabies specimens are submitted in a timely and efficient manner.

III. Policy: It is the responsibility of the local health department to see that specimens requiring rabies testing are safely obtained and that delivery to the laboratory for testing is timely and efficient.

IV. Implementation: This policy applies to any situation in which a positive diagnosis of rabies in an animal would result in some public health action such as human rabies post exposure treatment, confinement or euthanasia of a domestic animal, increased enforcement of animal control laws, or implementation of a public information campaign. Obviously situations in which there is a human exposure are emergencies and should receive greatest priority. In

planning for implementation of this policy, local health departments should remember to include coverage for nights, weekends, and holidays. The importance of establishing rapid and direct lines of communication with local organizations and individuals involved in rabies control may require the development of written, cooperative agreements or contracts with other organizations or individuals, such as local animal control authorities, the Commission of Game and Inland Fisheries, the Department of Agriculture and Consumer Services, or private veterinary practitioners.

V. References: None

VI. Responsibility:

A. Prepared by: Suzanne R. Jenkins, V.M.D., M.P.H.
Assistant State Epidemiologist

B. Approved by: Edwin M. Brown, M.D., M.P.H.
Deputy Commissioner for Health Care Services
Robert B. Stroube, M.D., M.P.H.
Deputy Commissioner for Community Health Services

C. Authorized by: C. M. G. Buttery, M.D., M.P.H.
State Health Commissioner

COMMONWEALTH of VIRGINIA

Department of Health
Richmond, Va. 23219

JAMES B. KENLEY, M.D
COMMISSIONER

November 3, 1983

POLICY AND PROCEDURE INSTRUCTION (PPI): No. 3.16

Title: Payment for Rabies Post-Exposure Prophylaxis

Effective: January 1, 1984

Expires: On Notification

I. Purpose: To define the responsibility of the local health department for the payment of post-exposure prophylaxis for rabies.

II. Background: The 1983 General Assembly repealed Section 29-213.23 of the Code of Virginia, Treatment of Persons Bitten by or Exposed to Rabid Animals. This required the local jurisdiction where the bite occurred to pay up to $500 for the cost of treatment for rabies.

III. Applicability: This PPI applies to all organization elements of the Office of Management for Community Health Services.

IV. Policy and Procedure: There are no longer any provisions of the Code of Virginia which specifically address the payment for post-exposure prophylaxis after exposure to a rabid animal. However, it remains the Health Department's responsibility to see that no one exposed to a rabid animal is denied treatment because of inability to pay. The following guidelines shall be used to determine the payment of treatment for persons bitten or exposed to a rabid animal.

1. Private Pay - Persons bitten or exposed to rabid animals should be advised to contact the holder of their health insurance, i.e. Blue Cross/Blue Shield, as most treatments are now settled through third party payments. When billing an insurer, the service should be coded as treatment and not prophylaxis.

2. Medicaid - Effective July 1, 1983, Medicaid will provide reimbursement to the local health department for rabies vaccine and immune globulin prescribed and provided to eligible Medicaid recipients. The Interagency Transfer Voucher (IAT) will be prepared for reimbursement by Medicaid for the rabies vaccine and immune globulin provided in health department clinics and for the

physician treating the recipient, if the Health Department furnished the vaccine and immune globulin to the Physician. If a person is treated by a private physician, the person is responsible for any extra charges imposed by that physician, such as a charge for administering the rabies vaccine and immune globulin. The administration fee if charged to Medicaid by the Health Department will be completed on the MAP-12CF form.

3. Declaring Persons Medically Indigent: If the person(s) being treated with post-exposure prophylaxis and immune globulin are not covered by a third party insurer which can be billed by the Health Department, a determination of eligibility will be completed to established the person medically indigent by using the current criteria in the Regulations Governing Eligibility Standards and Charges for Medical Care Services.
4. Co-payment Requirement of Persons: If the eligibility determination indicates the person(s) not to be medically indigent, then the appropriate co-payment or full charge will be applied by using the income levels established in the Regulations Governing Eligibility Standards and Charges for Medical Care Services. The total charges for each income catagory will be determined by adding the cost of the rabies vaccine and immune globulin given. The administration fee may be included if District Directors wish to do so.

V. Prepared by: Barbara W. Jernigan
Office of Management for Community Health Services

VI. Approved by: Herbert W. Oglesby, Assistant Commissioner
Office of Management for Community Health Services

Authorized by: Edwin M. Brown, M.D.
Deputy Commissioner

COMMONWEALTH of VIRGINIA

Department of Health
P O BOX 2448
RICHMOND, VA 23218

RANDOLPH L. GORDON, M.D., M.P.H.
COMMISSIONER

TDD 1-800-828-1120

January 30, 1998

Dear Party Interested in Oral Rabies Vaccine:

Thank you for your inquiry about the use of oral rabies vaccine for the control of wildlife rabies. At present, RABORAL-V-RG is the only oral rabies vaccine licensed by the United States Department of Agriculture for use in this country. The license limits distribution of the vaccine to authorized recipients designated by proper state officials and under such additional conditions as these authorities may require. The vaccine is restricted to use in State or Federal Rabies Control Programs that target raccoons. This means that individuals, even licensed veterinarians, cannot purchase the vaccine unless authorized by appropriate state officials.

In 1997, a Virginia Interagency Oral Rabies Vaccine Committee was formed. The core members are representatives from the three state agencies with an interest in rabies control (the Departments of Health, Game and Inland Fisheries, and Agriculture and Consumer Services) and a District Health Director. The committee members agreed to utilize specialists in such fields as ecology, animal control, virology, immunology, or wildlife management as consultants as needed. There was consensus among the committee members that there has to be unanimous agreement from all three agencies on any proposal to use oral rabies vaccine in Virginia. Additionally, such a proposal would also have to meet with the approval of the District Health Director(s) from the jurisdictions in which the vaccine would be used. Because the use of oral vaccine in an area would involve a variety of local resources and require the cooperation of local governmental agencies, the committee members agreed to consider only those requests to use oral rabies vaccine that come from local governing bodies. Requests from individuals or private organizations will be returned with the stipulation that they be submitted under the auspices of the appropriate local governing body.

Because the most appropriate and cost-effective strategies for the use of oral rabies vaccine, particularly in an area like Virginia where rabies is well established, have not been determined and because any such undertaking will require considerable resources, the Committee will require that any request to use oral rabies vaccine be accompanied by a well-thought out proposal. The proposal should address technical, public relations, and funding issues and should also include methods for evaluating the outcome of using the oral rabies vaccine in the proposed area (see attachment). Unfortunately, limited state resources preclude the planning and staffing

of an oral rabies vaccine campaign at the state level, but the committee will consider any reasonable proposal that provides for funding and the hiring of appropriate staff.

Thank you for your interest in rabies control. If we can be of further help, please let one of us know.

Sincerely,

Suzanne R. Jenkins, V.M.D., M.P.H.
Acting Director, Office of Epidemiology
Virginia Department of Health

for William M. Sims, Jr., D.V.M.,M.S.
Director, Division of Animal Industry Services
Virginia Department of Agriculture and Consumer Services

for Robert W. Duncan
Director, Wildlife Division
Virginia Department of Game and Inland Fisheries

for Robert B. Stroube, M.D., M.P.H.
Director, Fairfax Health District

Attachment

ISSUES TO BE ADDRESSED IN ORAL RABIES VACCINE PROPOSAL

BACKGROUND
History of rabies in area
Habitat description
Estimates of human and companion animal populations
Description of community and political groups with an interest in rabies control
Rationale for use of oral rabies vaccine in this situation including expected outcome

PRE-BAITING EVALUATION
Population studies/estimates of target species
Background levels of biomarker in target and non-target species
Background levels of rabies antibodies in target and non-target species
Placebo baiting trials

VACCINE PACKAGE
Description of bait and rationale for use
Description of attractant and rationale for use
Description of biomarker(s) and rationale for use
Label description

VACCINE DISTRIBUTION
Mode: (airplane, helicopter, vehicle, or foot) with rationale
Density (even distribution or targeted) with rationale
Timing (time of year, frequency) with rationale
Duration - estimate of number of years needed to continue
Contingency plans if a rabid animal is identified in the baited area

POST-BAITING EVALUATION
Biomarker levels in target and non-target species
Antibody levels in target and non-target species
Rate of bait disappearance or disturbance

STAFFING
Appropriate training, selection and monitoring of staff
Significant professional oversight by a veterinarian and wildlife biologist

COOPERATION WITH FEDERAL, STATE AND LOCAL AGENCIES
Centers for Disease Control and Prevention
US Department of Agriculture
Virginia Department of Health
Virginia Department of Agriculture and Consumer Services
Virginia Department of Game and Inland Fisheries
Animal Control officials
Law Enforcement officials

PUBLIC RELATIONS PLAN
How public will be notified
Who will handle calls from public

SAFETY
Notification and education of human and animal medical community
Recommendations for humans and animals exposed to vaccine
Special recommendations for immunocompromised persons exposed to vaccine

BUDGET
Costs
Sources of funding

CERTIFICATION OF APPROVAL BY LOCAL GOVERNING BODY